Volume 27, Number 2 April, May, June 1990 Pric

NETWORK

THE RAILWAYS OF AUSTRALIA QUARTERLY

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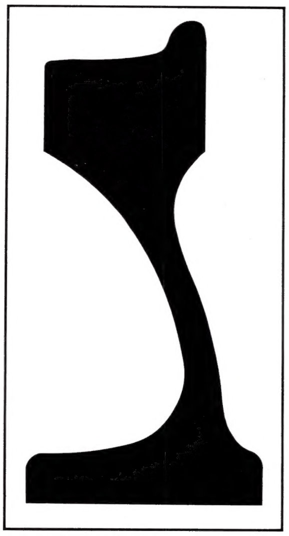

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THE RAILWAYS OF AUSTRALIA QUARTERLY

THE EXECUTIVE DIRECTOR'S COLUMN

This is the first column I have written in the 1990's, a decade that is bound to bring changes to our railway system. There is now enough interest from a number of quarters to ensure that change comes.

I recently had occasion to delve into the history of what is today the Railways of Australia Committee. Its origins go back almost one hundred years to the first Railway Commissioners' Intercolonial Conference, held in Sydney in September 1898. The minutes of that meeting make interesting reading, and there are many parallels with events today.

Competition was important then, as it is now. The Heads of the Traffic Departments were to discuss the "encouragement of intercolonial railway as against sea traffic". Today, we compete with interstate road freight.

There was active competition between adjacent railway systems for border traffic and the Commissioners directed that the Traffic Managers should meet to consider the problems involved, and "bear in mind the importance of approaching the subject in a Federal spirit". In fact, the Traffic Managers met the following month and agreed that "no colony shall be allowed to charge lower rates for the produce of a neighbouring colony, than for its own local traffic".

The predatory tactics previously adopted led to the inclusion in the Australian Constitution of provision for an Inter-State Commission. This body would be specially charged with ensuring that railway rates were fair and non-discriminatory. The Commission was established twice and has just been dissolved for the second time, its functions now included in the charter of the new Industry Commission.

In reviewing the acceleration of the Sydney and Brisbane Mail Service, the 1898 meeting agreed to leave the matter in the hands of the NSW Commissioners to see whether an earlier departure could be arranged without unduly disturbing NSW local business. The Queensland Commissioner drew attention to the advantage the change would have in completing the connection bewteen Southern traffic and that North from Brisbane. Not much has changed. We're still altering the schedule.

For many years the work of the Australian and New Zealand Railway Commissioners' Conference (as it came to be known) was carried out by a part-time secretariat. And then, in 1974, came a suggestion from Western Australia:

> *If the Railways of Australia are to portray a co-ordinated and uniform front to interested governments (Commonwealth as well as State) and to others, including our mutual clients, we should be setting up an organisation to act on our behalf which will adequately portray the wishes of the Commissioners and what they are endeavouring to achieve in respect of transport on a national basis.*

And, for 15 years, that is what the Railways of Australia Committee has endeavoured to do. Our task will certainly be different at the end of this decade but, reviewing the events of nearly one hundred years ago, will there be major similarities still?

My answer is — yes!

M.C.G. SCHRADER

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(Source: “N.E.C. Maintenance: Machines That Make a Difference”, Railway Age, May 1989).

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Source: “Stabilizer Turns Weeks to Hours for Fast Restart”, New Civil Engineer, October 1987).

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PA212

NETWORK

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April, May, June 1990

Queensland Railways' new 3900 Class electric loco hauling the Sunlander.

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QR will concentrate on providing quality service and aggressive competition says its Acting Commissioner.

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Cover: One of Westrail's new P Class locos at the head of a bauxite train (story page 13).

THE SILICO

Westrail is playing a major role in an exciting new export industry in Western Australia. It has begun a contract to cart 60,000 tonnes of quartzite a year from the Barrack Silicon mine at Cairn Hill, near Moora, to a new processing plant at Kemerton, in the state's south-west.

The rail authority will run five trains a fortnight under the $6 million five-year contract, a milestone for the transport authority.

"This is the first new bulk business deal we have signed for several years," says the Commissioner of Railways, Dr Jim Gill.

"It also fits in very well with our business target of providing complete transport packages, particularly for bulk products.

"The Barrack Silicon contract was won as a direct result of our proven ability to provide competitive, well co-ordinated door-to-door transport."

Westrail built a special siding at the mine at a cost of $100,000 to load the ore for the 345km trip to Brunswick Junction, where it is transferred to Malatesta Transport, a Westrail-associated road freight company, for the last 16km to Kemerton, near Bunbury.

The open-cut mine at Cairn Hill will operate for about six months of the year, shutting down for the rest because of dust and other environmental concerns. Trouble has been taken to hide the mine workings from the nearby Great Northern Highway, and it is planned to rehabilitate areas as they are worked out.

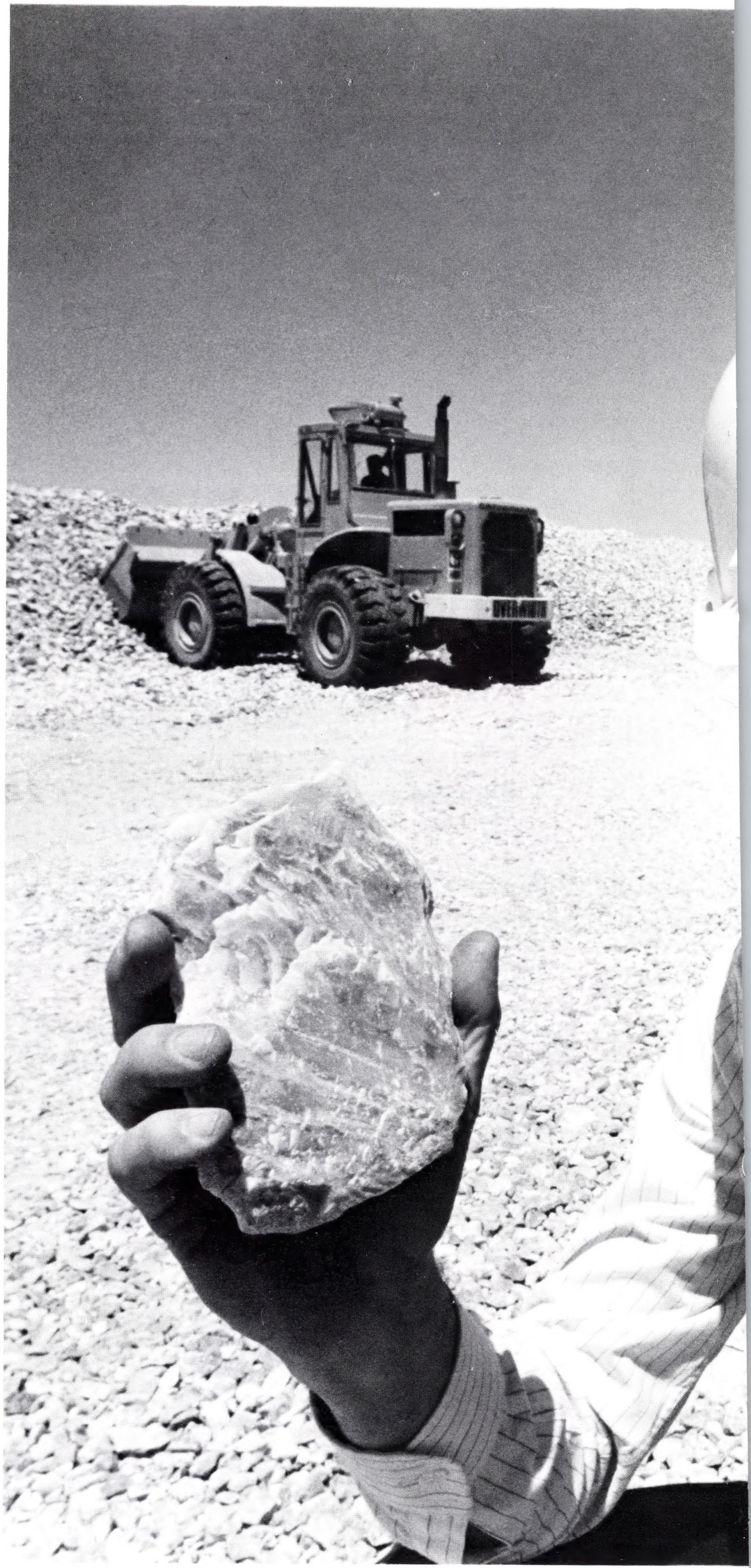
Some 200,000 tonnes of ore and waste will be mined to produce the 60,000 tonnes of quartzite the company plans to ship to Kemerton in the first year.

Barrack Silicon expects to more than double output by 1991.

After being crushed and wet screened to the correct size, the ore is stockpiled on site. A fleet of 16 RCJ-type wagons, each capable of carrying 40 tonnes of quartzite, will be tied to the business.

At Kemerton, the quartzite is combined with jarrah charcoal to produce a very high grade of silicon for export to the USA, Europe and Japan.

The product is used in a wide variety of products, including synthetic rubber, car parts, computers and cosmetics.



Westrail Commissioner Jim Gill at the official first railing of quartzite from Cairn Hill, near Moora, to Brunswick Junction on its way to Barrack Silicon's new processing plant at Kemerton, near Bunbury WA.

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FUEL SAVING BY DESIGN

ROA project promises fuel savings from new wagon designs

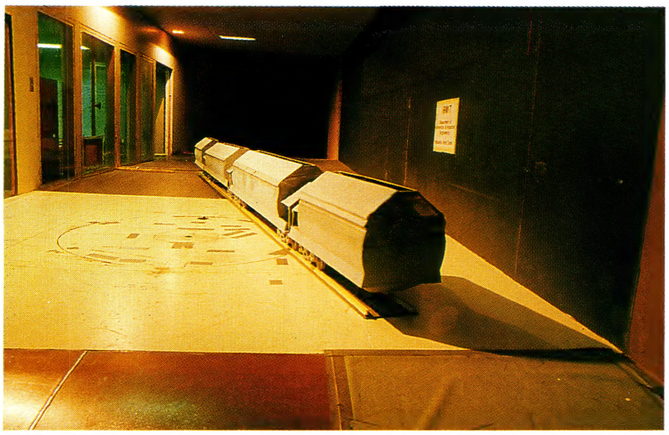
Tests on new designs of rail freight wagons developed by the Royal Melbourne Institute of Technology in association with Railways of Australia have shown that aerodynamic drag can be greatly reduced, making possible big energy savings.

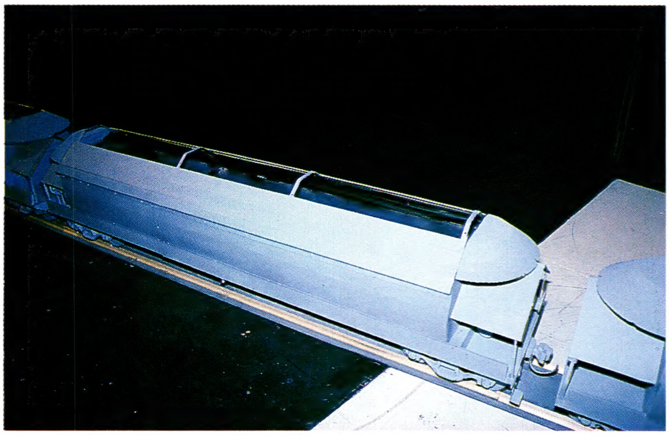
The wind tunnel tests suggest that railways ordering new wagons cannot afford to ignore the fuel savings and higher speeds the new designs promise.

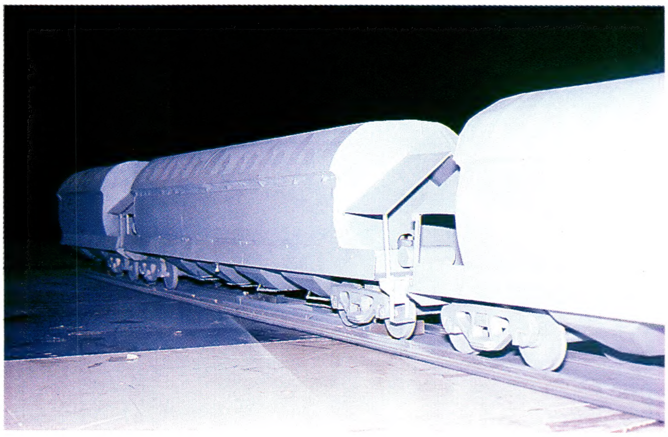
The ROA-supervised study by the Industrial Aerodynamics Group at RMIT has produced a wagon design called the Greenhouser which has emerged from tests with an impressive set of statistics. State Rail of NSW has evaluated the RMIT results and recommended proceeding to the stage of detailed design and evaluation.

The ROA-RMIT project has been funded by two large grants from the National Energy Research Development and Demonstration Council of the Department of Primary Industries and Energy. It had its origins when ROA's Michael O'Rourke approached Dr Jeff Saunders at RMIT with a view to investigating wagon aerodynamics.

It was decided to investigate hopper and tippler-type (gondola) wagons with features representative of a wide range of rail-system wagons. The hopper wagon was based on a SRA NHJF coal wagon with V/Line VHGY grain wagon details for the bottom.







Left, top: Model wagons in the RMIT wind tunnel, looking downstream.
Middle: Model wagons with 600mm radius rounded tops.
Bottom: The RMIT/ROA Greenhouser, a design with impressive test results.

RMIT built 1/10th scale models designed so that they could easily be modified. Once hopper tests were complete, the model was transformed into a tippler configuration based on the Queensland GH coal wagon.

For the last two years, the RMIT team has been investigating aerodynamic improvements of the two wagons in their wind tunnel. They found that they could realistically test models in a flow environment representative of a very long train if they measured the aerodynamic drag on the third wagon from the front in the configuration shown in the photograph.

Drag coeffficient (C_D) is a measure of aerodynamic efficiency. Based on experience, it is expected that a reduction in C_D measured in the wind tunnel will result in a reduction in fuel consumption by the percentage C_D change divided by between 4 and 6, depending on the operating conditions. For example, a 24 per cent reduction in C_D could be expected to reduce fuel use by between 6 per cent and 4 per cent as a first estimate. To calculate fuel saving more accurately on a specific operation, the estimated C_D can be used in an Energy Calculator, a computer program developed by ROA in conjunction with BHP Melbourne Research Laboratories.

From the wind tunnel results, RMIT predict the following reductions in C_D for an empty wagon to apply to train operating speeds of about 70km/h and an average annual Australian wind speed of about 11km/h.

The results showed that the tippler example had a much lower C_D (0.27) than the hopper (0.35). It is suspected that this may be due in part to the poor aerodynamics associated with the location of brake gear at the end of the hopper wagon, where it is more exposed to the airstream.

> ‘Even with a fully-laden wagon, RMIT found the Greenhouser reduced drag by 13 per cent’

Loading either wagon with coal to typical heights reduced the C_D by about 22 per cent.

Flat covers reduced the C_D by about 30-40 per cent, depending on wind conditions, whereas 600mm radius rounded tops reduced the C_D by 40 per cent for average wind conditions. (This highlighted why a train with open-top empty wagons travelling at high speed can use more fuel than a train loaded with coal.)

Bomb-bay doors gave a 10-15 per cent lower C_D than standard hopper bottoms. Whilst top covers worked well, there is a need for automatic loading without removing covers. For this the RMIT-ROA team has developed the Greenhouser, a partially-covered angled top that permits automatic loading and allows greater pay-load with less dust. It has a single radius-of-curvature aerodynamic fairing at each end.

This invention is shown in the photograph with a 1350mm gap that permits a 1200mm-wide loading chute. (The connecting supports spanning the gap will not be used in full-scale operation.) In this configuration, the Greenhouser reduces drag by 28 per cent. Even with a fully-laden wagon, RMIT found the Greenhouser reduced drag by 13 per cent.

As a final part of the NERDDC contract, State Rail has been investigating the cost-benefits of the Greenhouser. SRA used the ROA Energy Calculator to predict fuel savings for a low average speed of 56km/h on the hilly Ulan-Newcastle coal operation. On that route, the cost of retrofitting appears too expensive, but, the extra cost of new wagon designs incorporating the Greenhouser "would be minimal". It appears likely that it will produce net saving almost immediately, and SRA has recommended detailed evaluation of the design.

Incorporating the geometry in a tubular-type monocoque construction is almost expected to permit a higher strength-to-weight ratio and increased carrying capacity.

The invention is being patented internationally, but Australian rail systems have no restrictions on using the design. ROA members have the chance to make maximum use of this Australian development and all other results of the study.

RMIT hopes that before long these results will be tested in actual rail operations. This will provide not only information on fuel savings but also scientific data to improve RMIT's prediction techniques.

While the aerodynamic benefits shown in this study have been high, RMIT emphasises that these C_D reductions will vary with actual wagon geometry and the incident wind environment. Fuel savings will vary with route and the ROA Energy Calculator can be used to estimate them and to reassess designs.

The ROA-RMIT study also means that a test chassis and test facilities now exist to permit designers to evaluate alternative wagon designs. RMIT can also help in Finite Element Analysis.

Comparisons of energy efficiency between rail and road are interesting. For one configuration, a C_D for a modified tippler of 0.10 was measured for still-wind conditions. Dr Saunders noted that this wagon potentially carried 100 tonnes, equivalent to five road trucks, which normally have a drag coefficient of 0.6-0.8, thus offering considerable energy savings. When road safety and damage were also considered, Dr Saunders said rail was unquestionably the best heavy freight carrier.

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MEET WESTRAIL'S P CLASS LOCOMOTIVE

Westrail has taken delivery of the first of 16 new P Class locomotives, the first narrow-gauge loco in the world to use GE's Dash 8 microprocessor technology.

From January this year the P Class locos have been joining the Westrail fleet at the rate of one every four weeks to replace 21 older units operating on Westrail's narrow-gauge system.

The new locomotives mark the beginning of an important new replacement plan adopted by Westrail. The policy calls for the replacement of locomotives after about 15 years, much earlier than has traditionally been the case.

More frequent replacement is to ensure that the composition of the fleet is kept much more closely in line with operating needs. It will also ensure that Westrail, as far as is practicable, stays abreast of the rapid changes in locomotive technology and maintains its drive towards greater efficiencies.

The new locomotives are the result of a detailed and complex justification exercise that significantly advances Westrail's potential to compete in the commercial transport arena. They will mean a substantial reduction in operating costs through greater fuel economy, lower maintenance requirements, and greater reliability and flexibility.

Originally 15 P Class locos were ordered, but a contract to transport 400,000 tonnes of mineral sands from Muchea, 40kms north of Perth, to Kwinana meant another one was needed.

The introduction of new technology to narrow gauge produced a whole new set of manufacturing challenges for the successful tenderers, A. Goninan and Company, and Westrail.

"Because the P Class is the prototype unit with this new technology, it meant there was a steep learning curve to get the unit completed on time and to the stringent design standards imposed," said the Westrail Commissioner of

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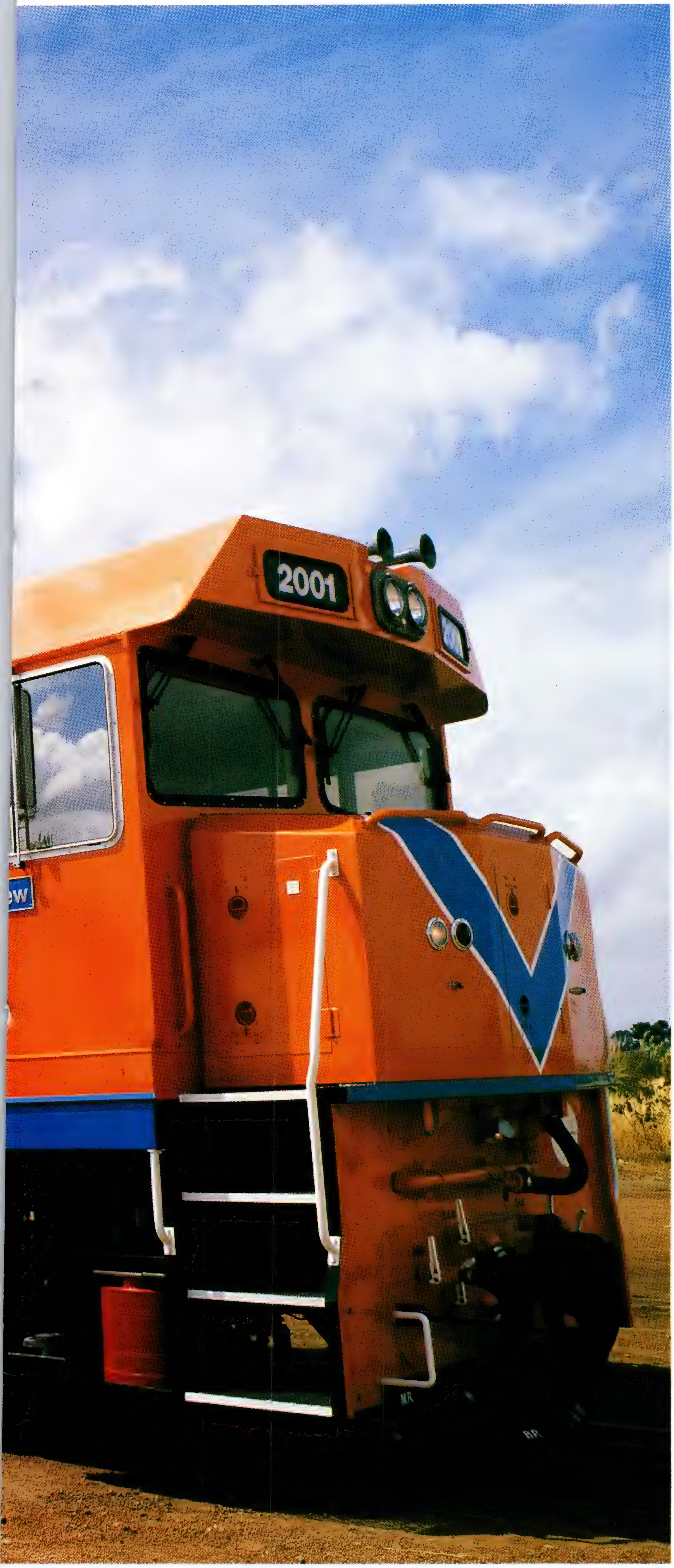

First of the new P Class locomotives built for Westrail by A. Goninan and Company marks the beginning of an important new replacement plan.

Railways, Jim Gill.

The most difficult task for engineering and manufacture was to achieve conformity to the tight – some said impossible – weight specifications.

"Achieving the required standards meant that some innovative design and mass management techniques had to be employed to control the ultimate mass."

The challenge was to go from a 195 tonnes normal loco weight to a 98.5 tonnes nominal weight for this new unit. Meeting it began in 1985 when Westrail's Mechanical Branch first proposed buying "new generation" locomotives to replace 32 narrow-gauge units.

Earmarked for replacement were locomotives either 30 years old and at their proposed phaseout limit or younger units with major maintenance problems. They are R, RA, C, F, G and A class units.

The justification for the proposal included results from a computer model developed jointly by the Australian Railway Research and Development Organisation (ARRDO) and Westrail for evaluating locomotive replacement strategies.

There were also comparisons of operating, maintenance (both scheduled and unscheduled) and fuel costs of the existing units with new locomotives. These costs were based on Westrail's estimated future traffic task for the haulage of mineral sands, talc, oil, grain and fertiliser, the basic workload of the locomotives to be replaced.

Results showed that the changes in locomotive design meant longer periods between scheduled maintenance, thereby giving a high unit availability for traffic tasks.

Once the West Australian Government had accepted the need to buy new locos, tenders were called for the design, manufacture, supply and delivery of between 15 to 20 diesel electric locomotives for use on 1067mm gauge railway.

The main specification was for a freight locomotive capable of hauling heavy trailing loads at relatively low speeds, the emphasis being on high tractive effort. There were also several other requirements:

☐ To maximise tractive effort and keep wheel-to-rail forces to a minimum, an increase above the maximum 96 tonnes locomotive mass, directly proportional to a reduction in

THE MOST CHALLENGING TASK WAS TO MEET WEI

unsprung mass, was allowed. The proviso was that lateral forces applied to the rail were not to exceed those of the existing 96-tonnes locomotives.

☐ High technology equipment was to be of well-proven design.

☐ Locomotive design needed to provide for effective maintenance, ensuring safe reliable operation at minimum maintenance cost.

☐ Locomotive design was to incorporate the latest developments in fuel efficiency, environmental acceptability, (for example, reduced noise levels and exhaust smoke emissions), and to provide crew comfort and safety.

Tenderers were also invited to offer alternatives for two major items: three-phase AC traction systems instead of conventional DC systems, and BO-BO-BO (TRIBO) bogie designs instead of conventional CO-CO configurations.

Both of these alternatives were offered by tenderers as an option, but they were not adopted after evaluation.

"The evaluation of the loco tenders involved staff from most of Westrail's branches and proved to be one of the most difficult tasks of all," Dr Gill said.

"Ten different configurations of locomotive designs were offered, plus options for five different makes of engine, seven different bogie designs, five different electric propulsion systems, plus further options for nearly every major item of equipment or system.

"This resulted in numerous mixes of design, ranging from the conventional engine-driven auxiliaries with DC (direct current) traction to all electrically-driven auxiliaries with AC (alternating current) traction.

"Almost all designs had some form of computerised control of the propulsion systems, including monitoring and diagnostics."

A preliminary assessment was done of the main points of each tender:

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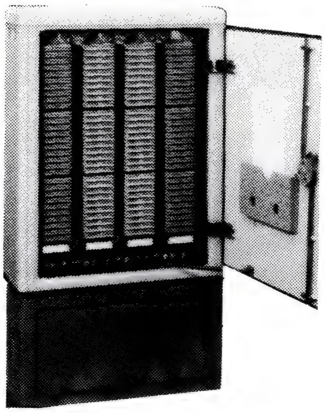

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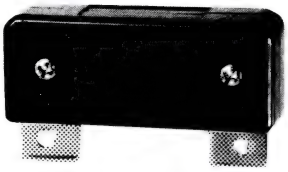

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PECIFICATIONS SOME CALLED IMPOSSIBLE.

☐ Unit costing: prices for the main offers based on the number of locomotives offered.

☐ Locomotive details, including identification of major items of equipment and body configuration.

☐ Engineering: where design and construction or fitout would take place.

☐ Delivery: delivery sequence and method of delivery, that is, whether locomotive fully assembled or partially assembled with full assembly carried out in Western Australia.

☐ Special terms: additional features offered, for example, special training programmes or extended guarantees.

After the initial appraisal, Westrail staff examined responses to the more important requirements of the general conditions of contract and the technical specifications.

The results, with assessment of each tenderer's known ability, commercial standing, diesel electric locomotive manufacturing experience, and the type and sourcing of the equipment offered, determined that only three of the five tender submissions warranted more detailed evaluation.

Although the locomotive offers gave a choice of European or North American engines, North American engines were preferred because of Westrail's in-service experience with the type, the similar operating patterns of the North American railroads, availability of spares in Australia, and the higher cost of European engines.

All the short-listed tenderers offered on-board micro-processors featuring logic control, excitation control, diagnostics and display. The microprocessors controlled performance, and monitoring and diagnostics of the propulsion systems with varying levels of input and output displays for both operating and maintenance staff.

With the exception of one tenderer, this equipment was not optional but part of the locomotive package and supplied by the manufacturer of the electric propulsion system.

The three short-listed tenderers also offered the following equipment:

☐ Desk top T-bar and brake controllers, in which Westrail had expressed an interest.

☐ Self-adjusting brake block actuators for operation on individual wheels requiring piped compressed air only for operation, thus eliminating the need for conventional brake rigging.

☐ Extensive training programmes, including formal classroom and hands-on teaching by skilled personnel provided by equipment manufacturers, and teaching aids.

A final contract cost and a total project cost were calculated using the contract price in dollars at the base date, making allowances for inflation and foreign exchange rate variations, costs of fixed pricing for overseas items, additions for design changes, spares, "in-aid" items, departmental costs, and testing equipment.

Each tenderer provided cash flows for the design and construction phase detailing estimated monthly cash flows over 30 months for Australian labour and materials, plus overseas material and expected customs duty.

The offers from three tenderers were then taken in order of capital cost.

The General Electric Dash 8 design submitted by A. Goninan and Co. was Westrail's choice because its commercial evaluation showed the offer contained the lowest capital and the lowest "whole-of-life" costs.

The Australian manufacturer also had a proven record in the design and construction of railway rollingstock of all types.

"A. Goninan also had access to the expertise of a world leader in the General Electric Company, which has designed and built thousands of diesel electric locomotives, both in the United States and throughout the world," Dr Gill said.

"The Dash 8 series – their latest design – has proven very successful over a number of years. Goninans had also based its offer on the construction of the locomotives in Western Australia."

The technical evaluation showed substantial compliance with the specification requirements. For Westrail, this was a "new generation" locomotive with the following features.

☐ The Dash 8 on-board microprocessor propulsion control, monitoring and diagnostic systems.

☐ All auxiliary equipment electrically driven and speed controlled, depending upon demand.

☐ Proven engine incorporating the latest developments giving much better fuel economy than existing locomotives.

☐ Proven traction generator that assists engine starting by being operated as a synchronous motor.

☐ Proven DC traction with a motor thermal

NEW TECHNOLOGY GIVES FUEL, POWER GAINS.

protection (MTP) system that removes the short time rating restriction from the driver's control; traction motors connected in parallel across the power supply without the need for field shunting or alternator transition; and a flash-over protection system that limits damage.

☐ Proven sentry adhesion system that also provides compensation control for varying wheel diameters.

☐ An earth fault system based on a graduated power reduction dependent upon the magnitude of leakage current.

☐ A unitised dynamic assembly with efficient cooling of resistors achieved by temperature sensor, motor speed sensor and variable motor speed control.

☐ Tricotrol CO-CO bogies incorporating primary and secondary suspension systems with floating centre axles, together with a reduced unsprung mass that it is expected will result in the 100-tonne locomotive exerting less lateral force on the track than Westrail's 96.7 tonnes DA class locomotive.

One of the main benefits on the new units is their fuel consumption. Estimates indicate the P Class locomotive will be 20 per cent more fuel-efficient and have considerably more pulling power, ranging from 30 up to 50 per cent better than the locos it is replacing.

The improved performance comes from the technology built in to the P Class. Apart from the on-board computers controlling and monitoring the engine and auxiliary systems and providing diagnostic information for maintenance staff, this includes a computer-controlled wheel slip control system.

This advanced level of control is achieved through an elaborate system of sensors and microprocessors controlling individual traction motors on the axles.

The sensors detect the beginning of wheel-slip and the microprocessors juggle the power to the traction motors to maintain optimum tractive effort. Wheel-to-rail adhesion is improved by up to 30 per cent.

The final specification was for 16.75 tonnes axle load maximum or 100.5 tonnes gross mass, with a nominal design mass of 98.5 tonnes. These requirements allowed for an unsprung mass/axle of 2.75 tonnes, standard wheel/axle and axle hung T.M., no special treatment to reduce unsprung mass, standard Vickers (Bradken) bogies and tricotrol bogies.

Full Dash 8 technology was an essential element, with AC drives on auxiliaries, and this together with dual brake requirements, added considerable weight.

Platform balance – the location of equipment to eliminate the need for added ballast to balance the locomotive – also came under the spotlight. This meant careful attention to the design of the underframe and superstructure.

The superstructures were all carefully analysed to remove redundant mass. The underframe has a taper flange, fishbelly beam of 350 grade steel, and light gauge steels and inset panels were used in superstructure components to maximise strength and minimise weight.

Throughout design and manufacturing, a mass tracking system used calculated, estimated or actual weights for components. A crane weight system controlled the mass and allowed components to be weighed as construction progressed.

This system was also used to determine the total mass of the locomotive by first weighing each bogie individually, then the locomotive, and adding the results.

Individual wheel loadings were determined by calibration of axle box springs and ensuring that axleboxes were of uniform height.

The challenge of the stringent weight conditions placed on the loco was met when the final specification of 98.5 tonnes was achieved.

As each locomotive is received, it is placed on a shake-down trial for two weeks, working the relatively small (single-headed) bauxite train between Kwinana and Jarrahdale. Loads have been increased from 35 XC wagons (the current D, DB, N, NA class limit) to 35 XC plus 5XBC wagons, increasing the tonnage from 608 to 720 net tonnes up the ruling gradient (830 tonnes have been hauled on a trial on this line). The gross mass on the return journey has been increased from 2849 to 3264 tonnes, an immediate indication of the economies attainable with this new unit.

After these trials, the first three locos have been involved in crew training at the Kwinana, Picton, Forrestfield, Manjimup and Narngulu depots, and also at the Midland Workshops, where Mechanical Branch staff received a comprehensive two-week introduction to the new units.

The locos first work is to haul mineral sands from Eneabba to Capel, general freight between Forrestfield and Pemberton, and to do general base services in the Geraldton District.

The benefits of the P Class are many. They will bring significant savings for Westrail by allowing the rationalisation of maintenance practices and spare parts inventories. They will provide higher usage in terms of improved load hauling capabilities. They will give improved transit and turn-around times and will allow greater flexibility of deployment, providing major savings in manpower and wages.

TOP SPIRIT

The Spirit of Capricorn passenger train introduced between Brisbane and Rockhampton in July 1989 has proved enormously popular.

Passenger numbers on this sector have more than doubled since the electric Spirit entered service. Last November, the Spirit carried 12,900 passengers, and the overnight Capricornian, which runs on Thursdays, Fridays and Sundays, carried 3,800.

In November 1988, before the Spirit of Capricorn was introduced, the Capricornian carried 6,500 passengers for the month.

The Spirit is the newest and most modern member of Queensland Railways' Traveltrain fleet. Initially, it ran six days a week, but in August a Sunday trip was introduced as a trial. This extra service has been well patronised and will continue indefinitely.

The Spirit covers the 630km between Brisbane and Rockhampton, Australia's longest electric passenger rail corridor, in nine and three-quarter hours, three hours less than diesel-hauled services before electrification.

64.6 Kph
40.4 mph.

The 20-car Spirit of Capricorn has multiple unit vehicles made up of either power pairs or trailer cars. (Power pairs consist of a driver motor car semi-permanently coupled to a motor car.)

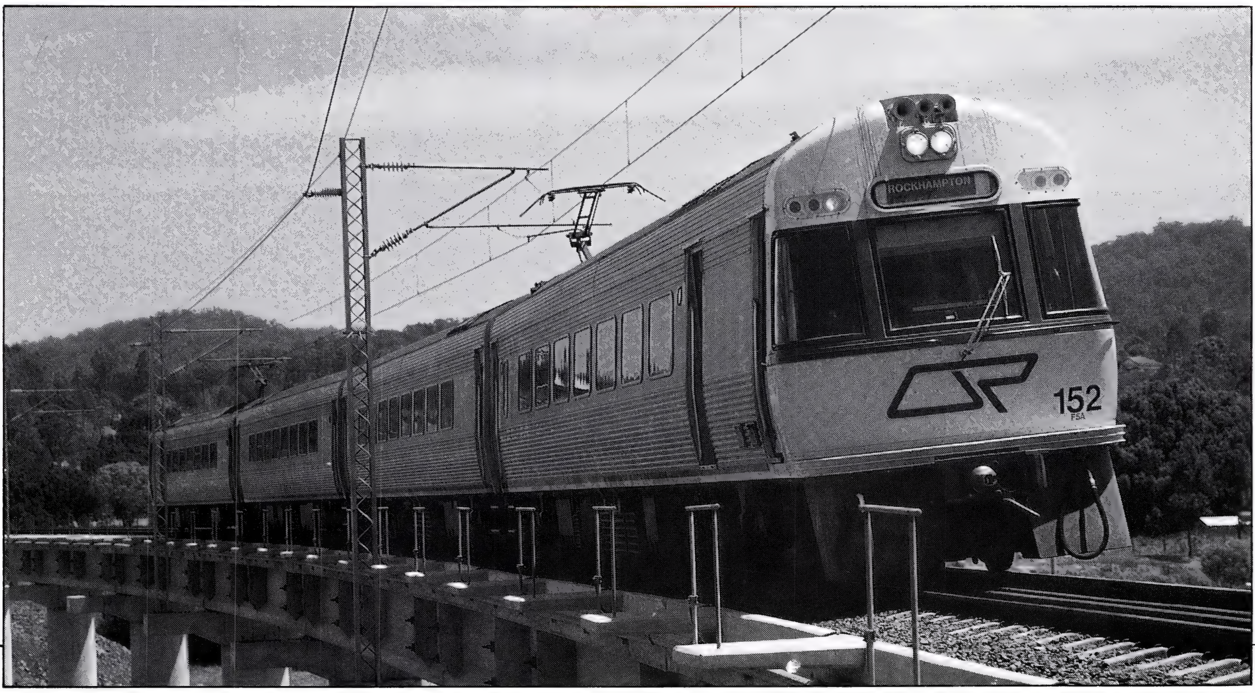
There is considerable sharing of traction and control equipment between the cars of the power pair set. Multi-function couplers at the ends of power pairs and trailer cars permit train consists of four, five or six-car formations, accommodating up to 276 passengers. Eight power pairs and four trailers were built by Walkers-ASEA at Maryborough, Queensland.

Spirit of Capricorn on the 630km run between Brisbane and Rockhampton: saving three hours on the diesel time.

All the Spirit vehicles are fully air-conditioned and equipped with full-length reversible reclining seats. The passenger saloon has overhead luggage racks incorporating speakers for the public address and background music systems and modules house individual reading lamps.

The cars are of stainless steel monocoque construction. Bogie, brake, traction and control system components are based on the designs of the successful Brisbane suburban EMU fleet, in service for up to 10 years. Modifications have improved reliability and efficiency but their resemblance has meant minimum infrastructure costs for driver and trade training and fewer spares. Traction motors are now fully suspended on the bogie frame to reduce track forces at the maximum operating speed of 120km/h.

Spirit of Capricorn trains are equipped with Automatic Train Control (based upon a Swedish system), deadman equipment and a vigilance system that automatically cuts in when working in non-ATC territory. The system provides for safe operation with one person only in the driving compartment.



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AN'S NEAL: LOOKING FOR MO

In the sometimes conservative world of railway engineering, Andrew Neal, Australian National's new General Manager, Technical Services, is not afraid to look for new ways of doing things.

But he is no advocate for change for its own sake. Neal's approach to engineering management is to decide on the goals and then find the means.

"Some of the people who work for me think I make changes without understanding the traditional ways of doing things," he says.

"I do understand, but there are some things that have to change if we are to be more efficient."

Andrew Neal's search for efficient solutions starts with the people he works with.

"I want to develop an attitude and atmosphere of openness and trust and of caring for employees," he says.

"I like to get out and talk to people. I want them to understand that I care about what they are doing, and I want them to develop more faith in management, rather than regard managerial staff as galahs in the ghost gums."

Andrew Neal's determination to take his staff with him to achieve necessary changes had impressive results in the nine years he was with Mt Newman Mining, first as superintendent of signals and communications, then as chief project engineer, and finally as railroad manager.

One achievement was to get locotrol trains running again after a 10-year black ban. It was done through talking to unions.

Andrew Neal pioneered the use of coded solid state circuits in Australia, which brought a 70 per cent reduction in Mt Newman's railway signalling faults. "I tried at Mt Newman to change the attitude that the railroad was an entity in itself. It became more flexible, and in keeping with what the organisation needed."

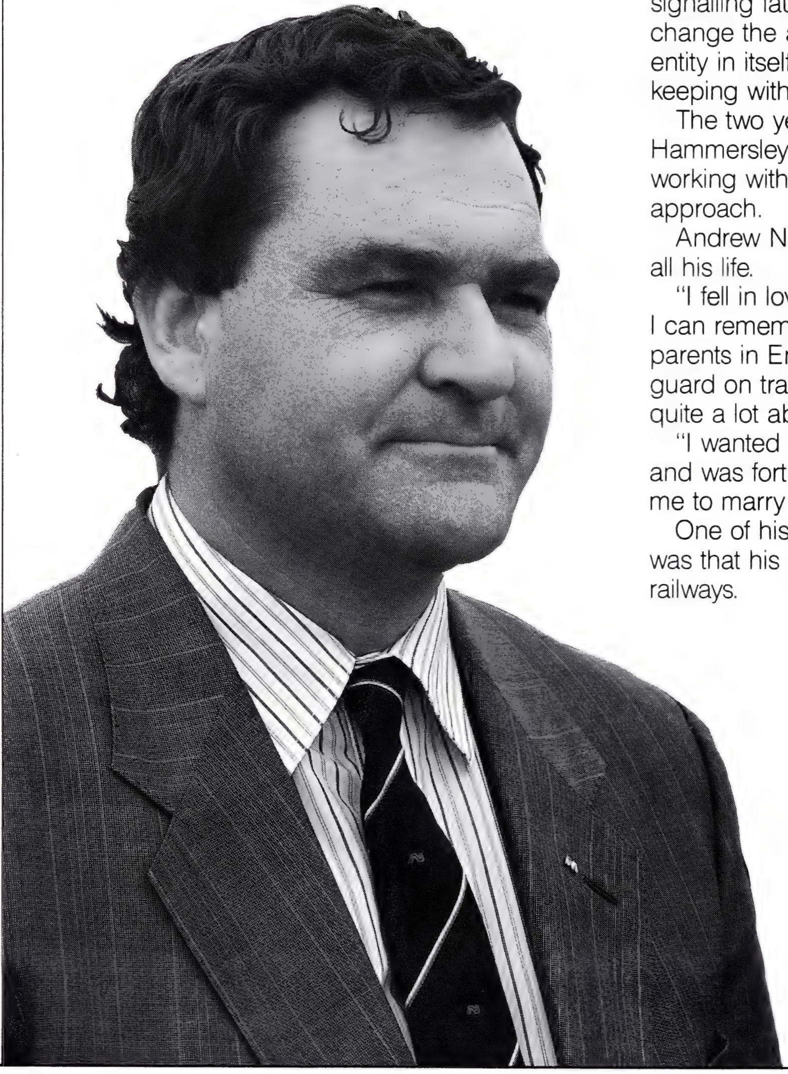
The two years Andrew Neal spent with Hammersley Iron taught him a lot about working with unions and the need for a unified approach.

Andrew Neal has been a railway enthusiast all his life.

"I fell in love with railways at the age of three. I can remember watching trains with my parents in England. My grandfather was a guard on trains, and my father therefore knew quite a lot about them.

"I wanted to become an electrical engineer and was fortunate that circumstances enabled me to marry my chosen career with railways."

One of his reasons for wanting to join AN was that his future with BHP was away from railways.



Andrew Neal, Australian National's new General Manager, Technical Services: building more faith in management through openness and trust.

FFICIENT ENGINEERING SOLUTIONS

Andrew Neal's first job as an engineer was with the South Australian Railways (which amalgamated with the Commonwealth and Tasmanian railway systems to form AN in 1975).

He has noticed marked changes, particularly at the Islington Workshops.

"They were rundown and inefficient when I was working for the SAR. The wheelshops were particularly bad. The modernisation of the rollingstock, and associated improvements in morale and the investment in the workshops were a pleasant surprise."

Andrew Neal's first impressions of AN on joining the organisation late last year were positive. "AN knows where it is going, but there is an enormous amount of work to be done to get there. The problems have been identified, and there is a plan to fix them, although it is going to take time.

"The fact that AN has been able to turn a large deficit around without any major mineral traffic like there is in Queensland or NSW, that AN has been able to make a profit from freight by improving performance and being reactive to the market says a lot for the system."

He sees great challenges in tailoring AN's engineering section to meet market demands. Neal believes that engineers no longer run railways.

"We need to look at ideas from overseas. Some railroads have running shops that are very close to the action. They may or may not be run by engineers. They could be run by the operations people, but subject to engineering standards."

One of Andrew Neal's priorities is to see AN's whole system in six months. "Nothing tells you what you need to know as well as your own eyes."

Another priority is scrutinising AN's signals and communications area where, with the exception of Austrac, there is room for modernisation.

"Austrac is a major departure and represents a whole new way of handling trains with radios and computers. I believe that if AN does not lead the world in the application of this type of train control system, we are very close to being the leader. Austrac is based on what is proposed in the USA, but there are very few railways investing in such a large and complex system.

"It will be the biggest single boost to transcontinental operations since steam was replaced with diesel traction."

AN has other high-tech developments underway, one of which is the Dry Creek motive power centre, the first major application of solid state interlocking.

Andrew Neal is excited about the application of computer technology to railway engineering. The new EL locomotives, the first due in mid-1990, have advanced computer technology.

"These computers make maintenance of locomotives much simpler. The computer will tell us what is wrong with a locomotive, and when it comes into the depot the computer will list the fault by number. Although the computers are not user-serviceable, they have self-diagnostics that will tell us when they need servicing.

"There is an increasing trend to use modems. The faulty computer can be removed from the locomotive and plugged into a telephone that is then linked by satellite to the USA manufacturer. Over the phone they can tell us what is wrong with the computer or fix it."

AN's track is another priority. Andrew Neal has already managed to have some speed restrictions lifted and is interested in the results of AN tests to find out what forces can be imposed on the system's 47kg rail.

"AN has set speed limits to reduce damage to rail rather than for safety reasons. Railgrinding on the standard gauge is one way of controlling this damage. The concrete sleepering program, together with better ballast and straightening of dipped welds, will lessen damage to rail from trains travelling at higher speeds."

Neal is convinced that the Adelaide-Melbourne line should be standardised, and AN is testing multi-gauge sleepers with this in mind. He is not sure, however, that rerouting the line to the north of Adelaide is the best alternative.

"I believe we should not overlook opportunities to improve the existing route or look at other alternatives, such as shorter deviations through the hills between Balhannah and Murray Bridge or possible lifting the line capacity by raising the height of the tunnels."

High tech rings bell for old safety drills

SAFEWORKING SYSTEMS USING THE LATEST IN ELECTRONIC TECHNOLOGY HAVE ALL BUT TAKEN OVER FROM THE "BELL AND STAFF" SYSTEM THAT KEPT RAILWAYS SAFE FROM THEIR EARLIEST DAYS UNTIL THE 1980s. **GEORGE BAMBERY** SENT THIS REPORT FROM ONE OF THE LAST BASTIONS OF THE OLD WAYS, ROCKBANK STATION IN VICTORIA, JUST BEFORE IT TOO JOINED THE MODERN ERA.

Bells are ringing at Rockbank. The Overland has just left Sunshine, and Rockbank's signalman, Robert Hogg, acknowledges the departure and requests line clear from Melton, the next station down the line.

He uses the electric staff telegraph, and winds the handle on the generator while tapping out a series of long and short bells.

It's not unlike Morse. Different combinations are used for passenger trains, freight trains, light engines, and so on.

The Melton signalman acknowledges with the appropriate bells to say the line is clear, and then "holds down" while cranking the handle. This action enables Robert to extract a metal rod, known as a staff, from a machine. The staff will be picked up by the express, authorising it to proceed over the next section of line.

Traditional railway safeworking this — the stuff four generations of train-running railwaymen cut their teeth on in Victoria.

The electric staff system was developed to ensure the safe passage of trains over single track lines. It was once used throughout the state, but is now being phased out in favour of new systems using the latest technology.

Each staff was numbered and engraved with the names of the two stations it could be used between. Train drivers checked they had been given the correct staff before proceeding.

To ensure that only one train was in a section at a time, the machines (called "instruments") in which the staffs were kept were electrically wired so that only one staff could be removed. Once it was removed, the instrument at both ends of the section automatically locked, preventing further withdrawals until the train cleared the section

Rockbank Station, Victoria: a dull whack and the last staff is exchanged.

and its staff was returned to the instrument at the next station or signal box.

This process was repeated all the way along the line, and the golden rule observed by all drivers, was simply: "No staff, no go."

That's the way trains ran safely on single-line tracks in Victoria from the early days of railways.

As trains got faster, the system was modified. With the miniature electric staff system, automatic exchangers allowed trains to collect and deposit staffs at express speeds (115 km/h). The apparatus is lowered from the locomotive and makes the exchange with a similar device on the ground. There are not many places on the network where it is still used, but don't blink if you ever get the chance to watch — it's all over in a second.

Adaptable as it may be, this, and most safeworking methods of the past, have relied heavily on manpower. There always had to be someone on duty to run the trains — to pull the levers for the points and signals, to exchange the staffs.

But things have been changing, particularly since V/Line was introduced in 1983.

These days signals and points can be changed by one person in a control room hundreds of kilometres away, as with Centralised Traffic Control (CTC). Or trains themselves can, to some extent, control signals, as with the Automatic Track and Control system (ATC).

The Melbourne to Adelaide corridor is a good example of modern CTC working. Almost all of this line as far as the South Australian border is controlled from Melbourne. A few places still use electric staffs but as funds become available they will be replaced with automated systems.

A relatively new development for V/Line in the safeworking area is the Train Order System, which has replaced electric staffs on most single-track lines. Train orders have been widely used in other states, particularly South Australia, and Australian National now uses them on about 95 per cent of its network.

Train orders are, as the name suggests, written documents that authorise train drivers to proceed to a given point. In many cases, the order will take the train through to its destination, but if not, the order can be valid to a manned station where another order can be issued for the next part of the journey.

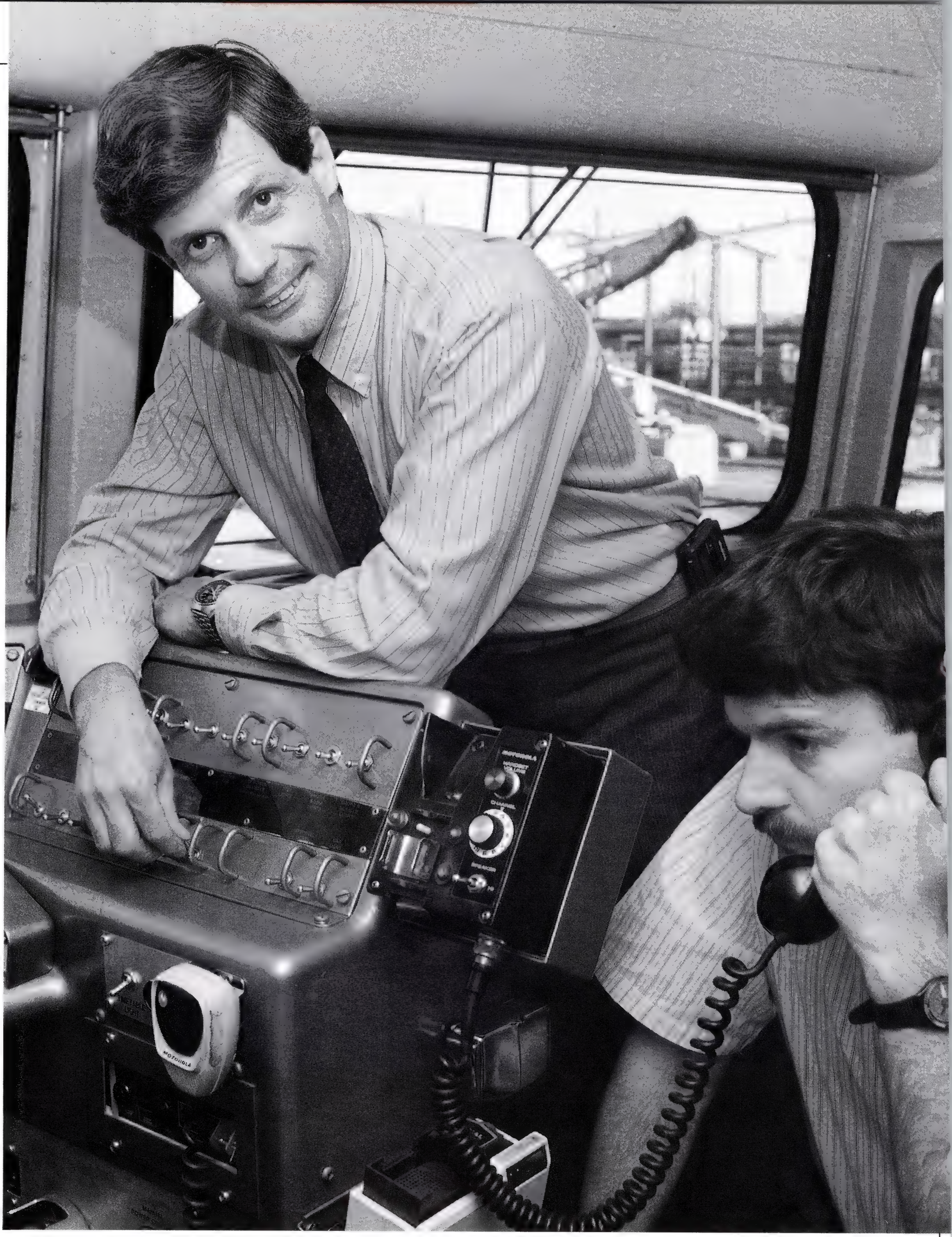
When required, an order will stipulate where trains travelling in opposite directions will pass. In railway terminology, this is known as a cross.

V/Line Safeworking Superintendent Maurie Diggle speaks of train orders with great enthusiasm:

"We've introduced them on most of the system now, but the Mildura corridor is the most significant. Now we often have trains travelling all the way between Dunolly and Mildura on the one order. If there are crosses, the orders specify where they will occur, and once the opposing train passes, the trains continue as per their orders," he says.

"We no longer need to keep all the little stations manned for safeworking purposes."

The introduction of train orders has been



Russell Wallace (left) and David Edmonds check radio equipment on V/Line's newest locomotive, G543.

possible because V/Line now runs fewer trains on these lines. Its new policy is to run longer trains instead of many shorter ones.

"We never could have done it in the old days — there were too many trains on the line," says Maurie Diggle.

V/Line's new communications systems have also played a vital role. With radio contact between train crews and train controllers, amendments to written orders can be made.

Maurie Diggle says that in normal circumstances this should not be necessary, but the system has to be able to cope with break-downs and other problems.

And V/Line is getting even more sophisticated: soon the train orders will be sent from train control in Melbourne directly to the driver of any train. For the past six months, the system has been testing Fax machines in locomotive cabs. This is one way orders could be issued while trains are on the move. Another possibility is video screens.

Whichever way it is presented, the information will be transmitted via the radio network, which can handle much more than just verbal communication.

Russell Wallace, an engineer with V/Line's Signals and Communications Department, was an early advocate of train radio — in fact his suggestion resulted in its implementation.

He recalls that getting approval "took some

V/Line has been testing Fax machines in loco cabs. Video is also a possibility.

doing," because it was a huge undertaking to radio-equip every locomotive in the fleet.

"I was working as a research officer in the Planning Branch at the time. I felt there was a need for such a system, but senior managers of the day weren't really interested.

"They couldn't see the benefits to be gained from 'highfalutin' technology — which it wasn't really because radio was widely established on railways overseas," says Russell Wallace.

Having been the commissioner's fireman and then a driver for three years, Russell had experienced many situations where radio would have been very handy, not just for peace of mind, but also to save time and avoid delays to other trains.

Persistence prevailed, and in 1975 he began official investigations into the project.

"The original intent was to provide communication between driver and guard," he says.

As a result of his work, radio was introduced on the Western Line to Adelaide, where V/Line's longest trains were operating. The length of these trains made it increasingly difficult, and sometimes impossible, to rely on hand signals.

Major benefits resulted. Train running times were cut as traditional operating methods were streamlined.

But after this initial success the project languished for lack of funding until 17 June, 1983, a date Russell Wallace remembers well.

"This was the morning a goods train hit the rear of the Spirit of Progress in heavy fog at Barnawartha. The driver and second person on the goods were killed, and there was a widely held feeling that the accident might have been avoided if the drivers had radio contact.

"Radio on trains became a hot issue at this stage. The outcome was a directive from the newly elected government's Transport Minister, Steve Crabb, that the entire locomotive fleet and all lines be equipped."

Since then radio has become an integral part of train operation. Guard's vans on the end of trains are no more, and technology does much of what guards used to do.

Battery-powered markers are attached to the train's last vehicle and a computerised system called TAILS (Train Automatic Integrity Location System) tells drivers that their trains are complete when they pass a computer and radio-equipped mast beside the track.

Over their train radios, train crews hear an alert tone, followed by a voice giving the location, direction of travel and confirming that the train is complete.

Back at Rockbank, The Overland's coming over the hill, and it's time Robert Hogg went for a walk to the auto (automatic staff exchanger) to watch the exchange. He'd like a dollar for every time he's done this in his 17 years at Rockbank.

Expectation grows with the approaching headlight turning night into day and the increasing roar of diesel engines. Air horns issue a loud warning for the road crossing, then the traditional greeting — a gentle toot.

A dull whack is heard and the exchange is made. In a few short seconds 16 carriages flash by, a blur of fluted stainless steel, leaving a breath of cool air on your cheeks from their slipstream.

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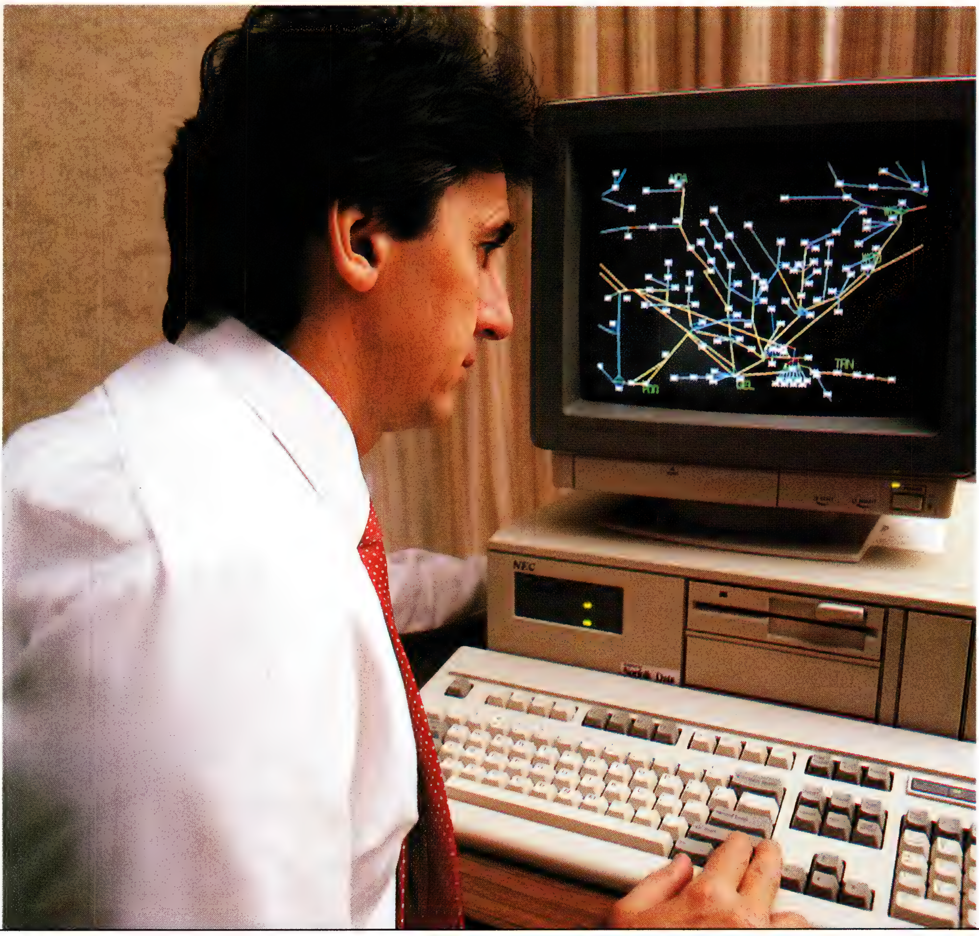
NEW ERA IN RAIL COSTING

A computerised rail costing system is changing the way rail managements cost and plan



RAILCOST presents the Australian railways as a network with each link representing an activity. The several thousand origins and destinations on a typical system's network are arranged into zones.

RAILCOST can quickly estimate the costs

A computerised rail costing system developed in Australia dramatically improves the costing and planning capability of railway managements.

The RAILCOST suite of computer programs, designed by rail consultants Travers Morgan, numbers among its users Australian National and the rail systems of New South Wales, Victoria, and Western Australia.

The costing requirements of a well-managed railway system extend well beyond the information available from conventional accounting systems. For railways to compete profitably, they need to know which of their many traffics, both freight and passenger, are earning adequate returns and which lines are providing positive returns.

Apart from knowing the financial performance of their business segments, railways need to be able to evaluate the cost effects of alternative traffic patterns, improved operating strategies, changes in manning levels, and capital investments in locomotives, wagons and infrastructure.

Railway costing systems to provide this kind of information have traditionally been derived directly from accounting systems, systems which have often found it difficult to handle the the effects of joint costs between different business segments. As a result, many railways authorities did not know with any certainty how all the different parts of their business contributed to the overall profits or losses of the organisation, or how alternative policies would effect financial performance. This was a major constraint on effective business planning and marketing.

Another problem was that for interstate movements, costing needed to be uniform between systems.

Following a series of meetings, a costing convention was developed that subsequently became known as NFG1. This convention is used by all Australian railways for the costing of intersystem traffics and has also become the standard for reporting costs to government inquiries and commission and outside authorities.

The NFG1 Convention was originally developed for costing point-to-point interstate movements but has since been used for a range of costing tasks, including total system, corridor and intrasystem block movements. To make the convention more satisfactory for an expanded range of uses, it has recently been upgraded to NFG2.

Why was railways costing so difficult? The chief reason was the joint cost problem.

Traffics or services operated by a railway can be broadly divided into two groups: those operations largely independent of other rail operations ("separable" traffics or services) and those operations that interact with others ("non-separable").

Examples of separable traffics are block train services, in which loading moves in trainloads of fixed consists of dedicated rollingstock. These operations are separable because the resources they require are attributable to the service. Here the train operating resources required can be calculated accurately, independently of all other traffics or services operated on the system.

By contrast, general and interstate freight is often semi-trainload, wagonload or less-than-wagonload (LCL), with traffics typically hauled on mixed commodity trains and in wagons that may be backloaded with various other traffics. In these cases, at least part of the

arge number of traffics and operating strategies

Why was railway costing so difficult? The chief reason was the joint cost problem

operating resources, and thus costs, are attributed to two or more traffics.

An example of jointness is an assisting locomotive used for a loaded oil train in one direction and then attached to assist a heavy grain train for the return journey. Another example is a wagon used for fertiliser traffic for an outward journey being used for mineral traffic on the return leg. Here the reduction of one traffic may have little effect on the number of wagons and trains run because these are essentially determined by the volume of traffic in the "loaded" direction.

To calculate the resources and costs attributable to these traffics means including in the analysis all traffics carried by the railway. Because of the great volume of data that needs to be considered on interrelated traffics and the multitude of calculations needed for rail networks of any significant size, these analyses should ideally be done using computerised techniques. And because there was no computer program available to do this, Australian rail consultants Travers Morgan designed the RAILCOST system.

RAILCOST is designed to estimate the operating resources and costs attributable to particular traffics by calculating the difference in operating resources between when the traffic is carried and when it is not.

The RAILCOST model consists of a suite of computer programs covering two distinct sub-models:

☐ A **linehaul** sub-model for determining the resources and costs of moving wagonloads of commodities through a railway network.

☐ A **terminal** sub-model for determining the costs of loading and unloading, shunting and collecting and distributing different commodities at different places in a railway network.

For this purpose, the Australian railways are represented as a network. Each link in the network represents a particular physical activity, for example, a main-line operation, a train marshalling link for traffic passing form the mainline to a branchline, or a bogie exchange link. The several thousand origins and destinations on a typical system's network are arranged into zones.

These are then combined with a matrix that provides the basic data on volume, revenue, origins and destinations of the various traffics.

Once RAILCOST has been set up for a rail system, it can quickly and cheaply provide cost estimates for a large number of traffics and operating strategies for various applications. Applications of the model includes calculating the cost of:

☐ All traffic segments.

☐ All movements of a particular commodity (for example, bulk grain).

☐ Specific commodity movements (for example, oil to a regional depot).

☐ Alternative marketing strategies for commodities (for example, introduction of regional freight centres).

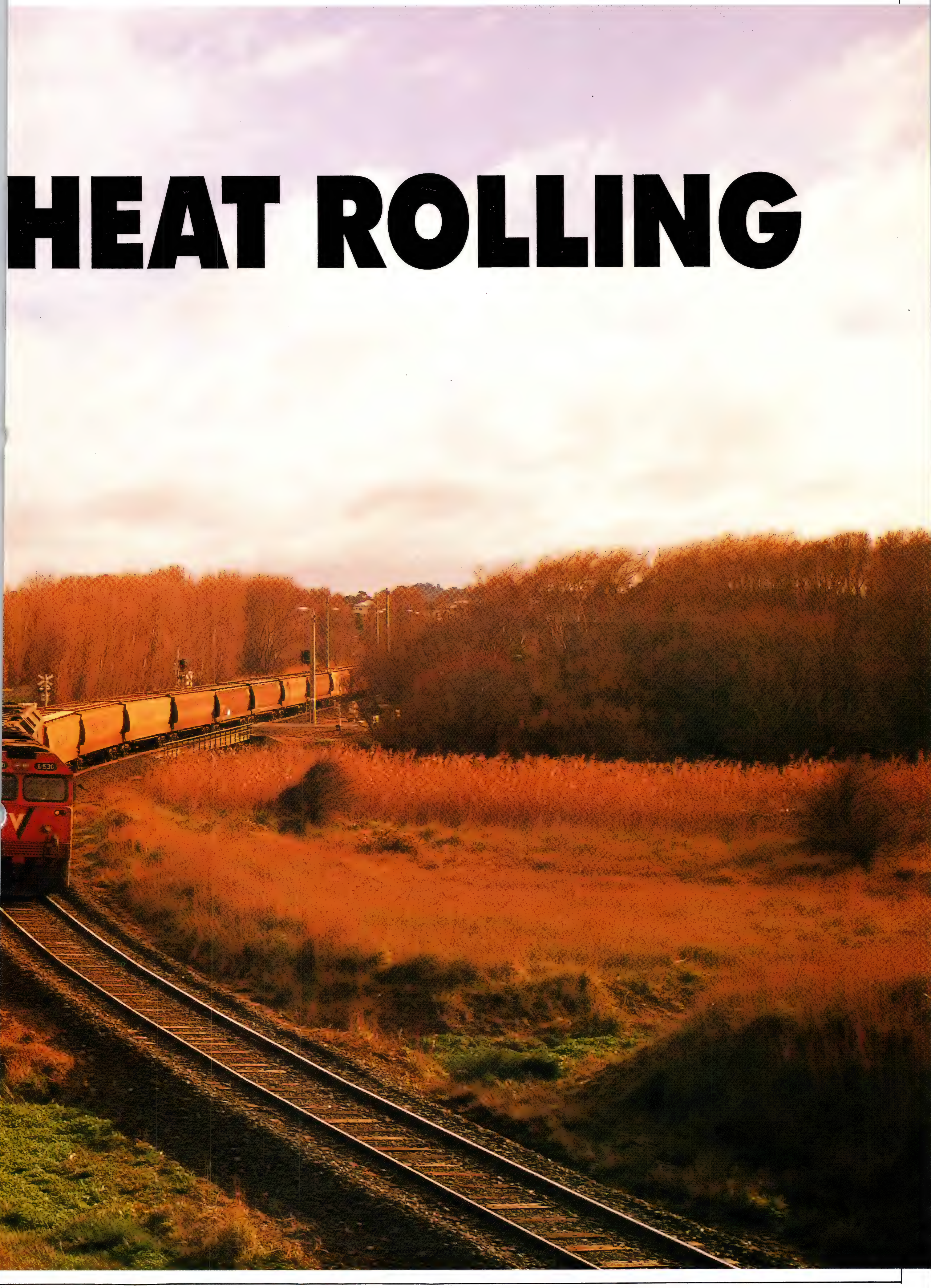
☐ Specific operating divisions, such as all traffics on a branch-line.

☐ Particular operating strategies, such as main-line electrification or introduction of block train working.

Last year the Travers Morgan group won the Transport Industry Award for development of the RAILCOST system. Chartered Institute of Transport national chairman Alan Hibble described RAILCOST as a major innovation by world standards.

KEEPING THE V

HEAT ROLLING



V/Line can now move the wheat

In the last four years there has been a real reduction of 41% in V/Line's grain freight rates

By keeping their wheat on rail with the wagons rolling around the clock, Victorian graingrowers are getting the best grain freight service in the country.

V/Line has developed a grain freight system that is the envy of other states and in advance of deregulatory trends in grain marketing.

V/Line can now move an average three million tonne harvest at costs 25 per cent lower than a decade ago.

V/Line has continued to cut grain rates, and this year has extended its on-farm road pick-up service to include growers on the Yanac, Carpolac and Bolangum (closed) lines.

Overall, average rail rates for wheat have been reduced by $2.50 a tonne for the 1989-90 season.

"The rates are 11 per cent lower than last year's," says Terry Roche, V/Line's newly-appointed Grain Marketing Manager. "That is a real reduction of 18 per cent, allowing for the inflation rate.

"That means that in the last four years there has been a real reduction of 41 per cent in V/Line's grain freight rates.

"As a result of the new Wheat Marketing Act, the Australian Wheat Board (AWB) negotiated a new grain freight contract with V/Line for the current season, based on the export freight task," Terry says.

"The value of the wheat contract to V/Line is approximately $32 million for moving an estimated 1.75 million tonnes. This represents a saving of $3.6 million for growers."

The AWB's Senior Operations Manager, Graeme Watsford, says that the thrust of the new legislation is towards deregulation, with the AWB able to maximise returns to growers by directing grain receivals to the most efficient handling and transport operators, irrespective of state boundaries.

"This new contract shows that V/Line has accepted the challenge of deregulation more readily than the other states, and is prepared to do something about it," Graeme Watsford says.

The Victorian grain harvest this year was well below the bumper crops of three million tonnes or more in previous years, due mainly to unseasonably wet conditions for sowing and germination.

With the expected movement of 450,000 tonnes of barley and 1.75 million tonnes of wheat. V/Line's total freight task for 1989-90 is well below the capcacity of the grain handling and transport system in Victoria, designed for the efficient throughput of four million tonnes a year.

Since 1983, V/Line has invested nearly $150 million in remodelling Victoria's grain network for the 21st century and demonstrating its long-term commitment to serving the grain industry.

As part of its plan to put more grain on rail, V/Line has extended its road on-farm pick-up services to include border areas in southern New South Wales and growers along certain closed lines whose grain might otherwise not enter the V/Line network.

"It makes economic sense to reduce the excess capacity of the network and ensure as much grain as possible goes by rail in Victoria in order to reduce costs to growers," Terry Roche says.

"Because of the relatively high fixed costs of rail services, any loss of tonnage could substantially increase unit costs for the remaining users of the network.

"It is also in the national interest for each state's bulk handling and transport system to be as efficient and competitive as it would be in a completely deregulated environment.

"In Victoria the grain freight task has been fine-tuned to the extent where it pays growers to go with V/Line."

The Grain Operations Plan for the 1989-90 harvest was based on the movement of three

rvest for 25% less than a decade ago

Since 1983, V/Line has spent nearly $150m on remodelling Victoria's grain network for the 21st century.

trains a day into Geelong and two into Portland.

The Geelong trains have 42 bogie wagons 2310 T and the Portland trains 55 wagons, each) 3025 T. carrying 55 tonnes of grain.

In 1980, VicRail used 6,379 wagons, mainly four-wheeled GYs, each carrying 22 tonnes maximum, and 80 locomotives to bring in the harvest.

This year, V/Line used only 700 bogie hopper wagons and 26 locomotives for the task.

"We keep the wagons rolling now, whereas we used to have long lines of four-wheelers lying idle, waiting for movement," Terry Roche says.

"They had to be shunted in and out of silo sidings and marshalled at regional yards into bigger train units.

"Most of the grain in excess of storage capacities at local silos and up-country receival sites was double-handled into and out of regional sub-terminals at Murtoa and Dunolly, which each received 15 trains a day.

"In 1980, there were 16 small trains a day into Geelong, and seven into Portland, each with a gross weight of between 700 and 1,000 tonnes, whereas today's trains to Portland (with 55 bogie wagons) have a gross weight in ? excess of 4,000 tonnes."

Consolidation of the grain network using Central Receival Points (CRPs), together with an investment in new locomotives and rolling stock, line upgrading and improvements to CRP sidings, have all been part of the push to keep V/Line on track as the prime mover of grain in Victoria.

A CRP is a site where grain is received and cleared continually throughout the harvest. They are strategically located in grain catchment areas so that road haulage distances are limited to a 60km round trip from surrounding farms.

All the other receival sites and silos in the network are filled once and closed until the next season. There are differential handling and freight rates at fill and close silos to encourage growers to deliver to the CRPs.

Each of the 54 CRPs is cleared by a "block train" with a fixed number of wagons (42 to Geelong and 55 to Portland) during the harvest that returns to the CRP within 48 hours of despatch.

In recent years, as part of the consolidation of the grain network, a number of light grain lines uneconomic to upgrade for heavier traffic with bogie hopper wagons have been closed.

The grain from silos along those lines is picked up by V/Line road contractors and taken to the nearest CRP for transport by rail to Geelong or Portland.

In the 1988/89 season, V/Line successfully introduced an on-farm pick-up service for growers along the Meringur line in the Millewa area of the northern Mallee region.

For an extra $2.50 a tonne, growers had their grain picked up by V/Line's road contractors and delivered directly to the CRP. This in turn saved V/Line and the Grain Elevators Board (GEB) the extra handling and freight costs incurred from fill-and-close silos.

Most of the growers in the area took advantage of the road pick-up because it was cheaper than driving their grain across the border to South Australia.

A temporary office was set up at Werrimul, and V/Line operators were in radio contact with the truck drivers and growers.

This year, for the Wimmera region the Horsham Freightgate was used as a base for radio contact, and there were temporary offices at other locations, including Werrimul and Oaklands. The whole operations went off with military precision.

At the start of the season, V/Line management and staff met nearly every grower along those lines, all of whom were impressed with the service. As V/Line sees it, it is in partnership with growers.

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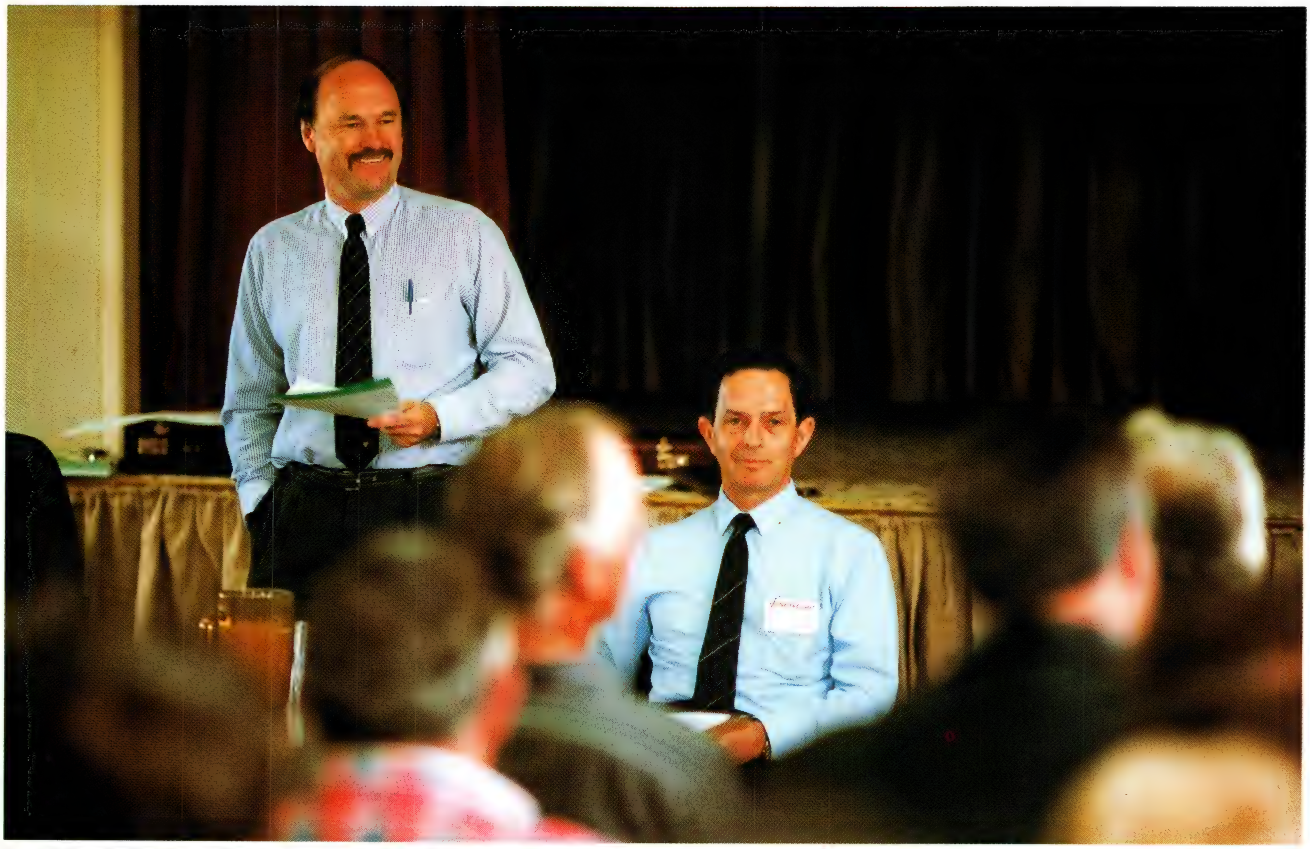


David Vendy (left) and Peter Jennings of V/Line's grain team talk to grain growers in Wetherby before this year's harvest.

N

Grain team meets the customers

Have you blokes really cut your costs at all? Have you compared total grain handling and transport costs in Victoria against the interstate alternative?

Can we still deliver to the local silos?

What are those rates again — at the silo and the CRP?

What is V/Line doing to get more freight on rail and off the roads?

The V/Line team was not short of questions to field on this year's round of meetings with growers from Morundah in New South Wales to Berrigan in the north-east, Netherby in the west, Marnoo, Murrayville and Wentworth, not forgetting Goroke, Kaniva, Werrimul, Swan Hill and Corowa. The pre-season meetings were well-attended by growers along the Yanac, Carpolac and Bolangum (closed) lines in the Wimmera and the closed Meringur line in the Mallee, by growers around Laharum near Horsham, around Yelta above Mildua and from the Oaklands area over the border from Yarrawonga.

Peter Jennings, the Senior Marketing Manager of Grain and Heavy Industries in V/Line's Freight Division, Terry Roche, the Grain Marketing Manager, and Regional Marketing Managers David Vendy and Bob Bush were well received at every meeting.

"The Victorian network is volume sensitive," Peter Jennings says. "We need as much grain as we can get in order to spread overheads or fixed costs, especially in below-average seasons. So we want to bring back the grain that has been going over the borders in past years.

"We also want to defray the costs of double-handling grain to consolidate stocks along closed lines and move on all grain catchment areas 'at-risk', areas where grain might be taken out of the V/Line network.

"The more growers using the V/Line network, the lower the unit costs. Conversely, any loss of tonnage could substantially increase unit costs for the remaining users.

"We now have a very efficient grain freight operation at the most competitive rates. We are continuing to cut costs and pass those savings on to growers. This year average wheat freight rates have been reduced by $2.50 a tonne, but we can only keep rates down by putting as much grain as possible through the system."

The growers at all 12 meetings were well-informed and largely supportive of V/Line's moves on the grain front.

At all meetings the V/Line representatives were asked why V/Line and other rail authorities were not able to get the trucks off the roads, especially on interstate routes.

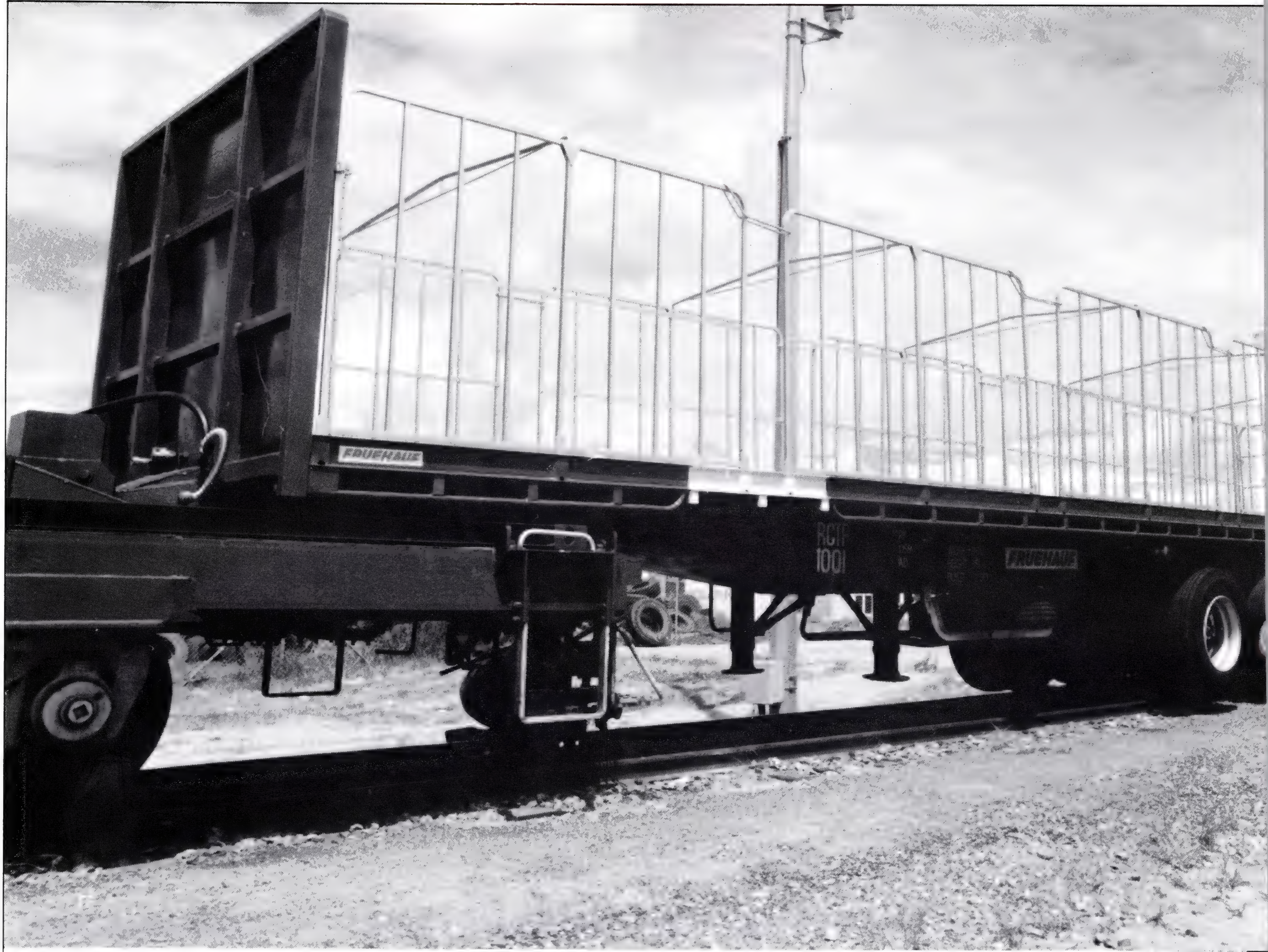
Most growers are opposed to long-distance grain haulage by road, but are behind an on-farm road pick-up service, especially if they know the local contractor or "subbie."

The greatest curse to growers at harvest time is the long queue at the local silo. Anything that gives them more time on the job in the paddock is more than welcome.

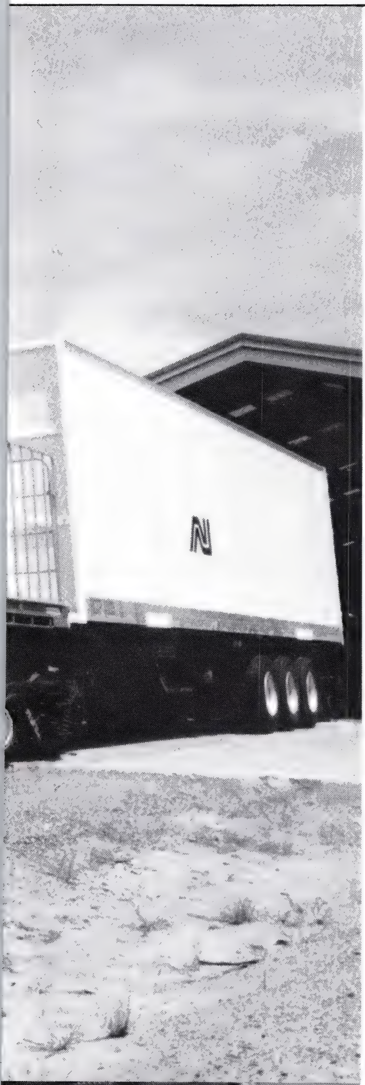
The pick-up services keep the local truckies on the move and cost less to most growers than carting the wheat themselves, or paying someone else to cart it.

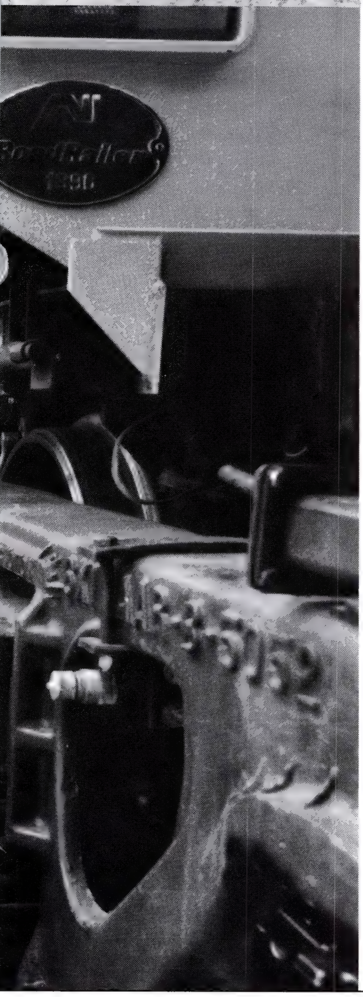
The radio links between growers, local haulers and V/Line were well received, saving more time and money.

V/Line received an estimated 60,000 additional tonnes on rail this year as a result of the pick-up services.



The RoadRailer semi-trailer transfers directly to rail with no lifting for inter-capital city linehauls. Right: Wayne Clift (left), Mark Holowiecke and Geoff Williams of AN's mechanical engineering staff look at a RoadRailer wheelset.





Dr Don Williams (left), chairman of AN, Bob Brown, Federal Minister for Land Transport, and Russell King, managing director of AN, discuss the RoadRailer.

AN JUMPS THE TRACKS WITH ROADRAILERS

While debate about the hazards of trucks and semi-trailers to other road users and their cost to the whole society goes on, Australian National has found a way to put trucks on rails.

The solution is RoadRailers, pantechnicons and semi-trailers that can run on rail as well as on road. Maxicube, a manufacturer of commercial road vehicles, made the first six for AN, initially for use on the Adelaide-Alice Springs route.

The conversion from road to rail takes less than four minutes. The road unit tray is lifted (easily done by inflating an air bag between the wheels and the tray), and the wheels are replaced with rail bogies.

RoadRailers will mean that freight can be carried by rail for long distances between cities and can then complete its journey by road without having to be unloaded and reloaded.

RoadRailers were developed in the United States, and AN was quick to realise their potential for our long-distance intercity routes. AN recently became the exclusive licensee to manufacture, market and operate RoadRailers in Australia. The trucks appeal to customers because they are quick and easy to operate, and loaded only once, and can carry greater payloads because they are lighter than conventional rail wagons.

Perhaps the greatest advantage of RoadRailers is their superior ride. Damage to goods will be a thing of the past.

The idea of carrying pantechnicons by rail is not a new one. AN has carried semi-trailers piggyback-style on special flat wagons for years. Piggybacks cannot be carried on some major routes however, because of height restrictions caused by tunnels and other overhead obstacles. RoadRailers can be used on these routes because they are 1.25-metres lower.

As RoadRailers are cheaper to run, AN's rates for transporting them rival road freight rates.

Want to know more about Australian Railways?

The XPT (Express Passenger Train) just south of Goulburn, N.S.W.

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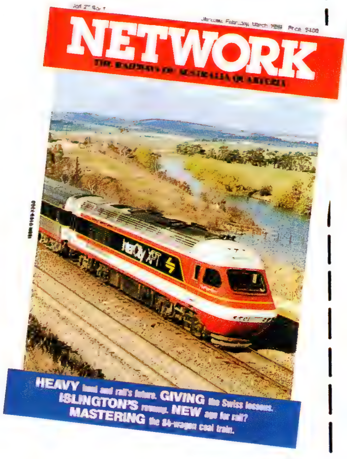
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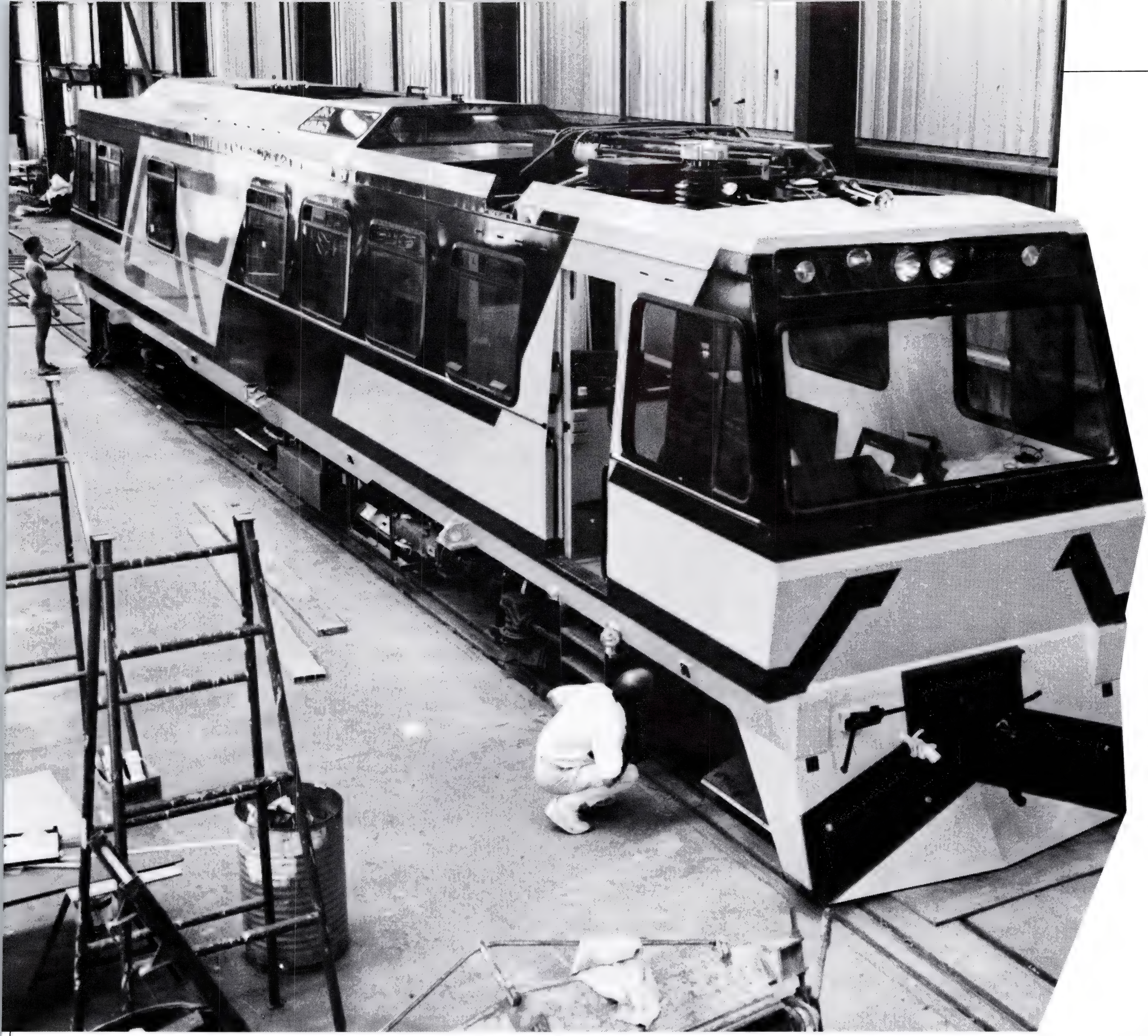


QR'S WORLD FIRST

Queensland Railways' new MMY004 track and overhead recording car being built at the Tamper (Australia) factory at Strathpine, Brisbane. Its measurement and reporting system is built by Electrologic of Sydney.

Queensland Railways is about to commission a new track and overhead recording car, designated MMY004, built to its own specifications based on experience with the upgrading of a Matisa PV6 car and believed to be the first of its kind in the world.

The car has been built at the Tamper (Australia) factory at Strathpine, on the northern outskirts of Brisbane, at a cost of $2m. Its measurement and reporting system was built by a Sydney company, Electrologic, as a subcontractor to Tamper.

Computerised recording of track and overhead from recording vehicles is an increasingly used method of monitoring their condition and safety. The special vehicles measure the track and overhead thousands of times each kilometre, detecting and reporting defects in geometry of track overhead. Statistical "condition indices" can decide whether track requires maintenance and when.

The main element of Queensland Rail's new system is Electrologic's Railscan system, which feeds digitised optical images from video cameras to the analysis systems. The self-propelled bogie-mounted car will travel at speeds up to 100km/h, and is designed to be towed at up to 120km/h. It has an axle load of 12.5 tonnes.

Car MMY004 uses 10 Railscan cameras to measure the position and profile of the rails at different points under the car.

In addition to the normal geometric track parameters of surface, twist, gauge, cant and line, the car will record rail profiles and measure rail wear. It will also measure grades, curvature, and detect rail head corrugations.

Overhead will be measured by an instrumented pantograph, which will measure height of wire and lateral displacement in relation to track centreline and also pan head accelerations, wire voltage, and loss of contact.

The combination of all these measurements in one vehicle will be a world first.

The recording vehicle will be staffed by three operators and a locomotive driver. Its front desk will have a track console with graphic display and event panel for input of events and comments.

A raised observation dome has an overhead display and event panel. At the centre of the car is an overhead operator's console, and the main console is behind the track console. The main console operator controls the analysis and reporting system, monitors accuracy and performance, and controls the running of the car.

Collecting and analysing the data is of course only the first step. Using it is the next. QR has developed a practical training scheme to teach train maintenance supervisors to make the best use of the track recording reports. Regular workshops explain how to use the various reports to plan and program maintenance work.

Queensland Railways' increasing use of sophisticated electronic equipment is an example of the way the falling cost of computer power is causing a revolution in information handling in all railways. Because of their integration and general self-sufficiency, railways are well placed to benefit from advances in data collection and analysing and other rail systems have shown considerable interest in QR's new recording car.

The challenge now is to ensure that the wealth of information flowing from the machine is used ot the best advantage.

Three "environment" video cameras will record the track and overhead on videotape. These cameras are on line to the computer system, and date, time, location, and exceptions will be printed on the video images.

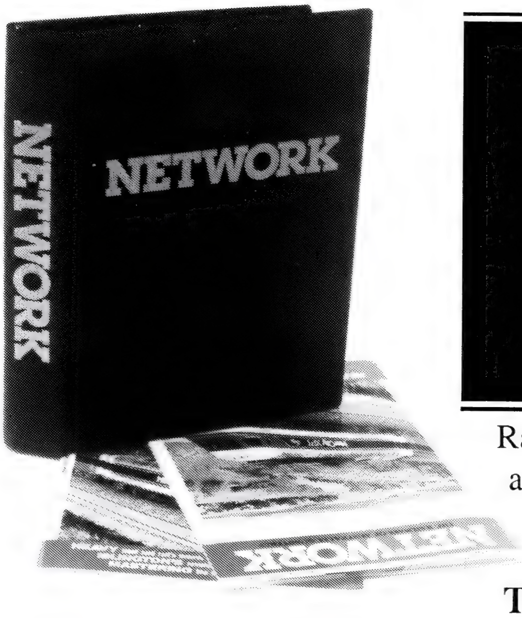
The car uses four IBM PS/2 computers. A main computer carries out analysis and reporting functions, and the other three display graphics of track and overhead and computer system performance to operators.

Exceptions from set thresholds and condition indices and means will be reported in real time, with graphic printouts and lists in standardised formats.

Raw data will be recorded on 200 MB optical disks, for transfer to a "post analysis" computer system to be installed in the Chief Civil Engineer's office. This will further analyse the raw data, and record summarised files of track condition.

It will be possible to use these files to detect abnormal deterioration of track that calls for upgrading rather than normal maintenance.

Files will be organised in a library, with a file for each recording of a line section.



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In the past 30 years, Queensland Railways has changed from a relatively small transport organisation into a large billion-dollar business.

Between 1960 and 1989, freight tonnage grew from 7,747,187 to 80,208,825, passenger journeys from 32,197,469 to 50,943,472, and income from $69.71m to $1,107.13m. Over the same period, operating expenditure went from $74.96m to $931.24m, and a loss of $5.25m in 1969 changed to a profit of $175.88m in 1989.

The electric-hauled Queenslander passenger train leaves Roma Street Station for Cairns.

QR'S DECADE OF CHALLENGE

Other figures point to marked changes of other kinds: the number of wagons fell from 27,396 to 20,224, the number of locomotives from 813 to 622. But the average train load rose from 353 tonnes in 1969 to 915 tonnes twenty years later. Finally, the total number of staff declined from 28,566 to 21,465.

The freight and passenger task has thus increased greatly and this has been achieved with fewer wagons, fewer locomotives and fewer staff. Productivity has increased significantly through the introduction of a wide range of new technologies, improved operating and maintenance procedures and improved management.

Over the past 15 years in particular, we have made much progress in our drive to become more efficient.

In the operating area there is a program of increasing train size and weight. The largest of our trains is 10,500 tonnes gross, but we expect these to be increased now to 15,000 or even 20,000 tonnes. We have been increasing the number of express freight trains with a consequent reduction in the number of "slow" freights.

Electrification has increased operating efficiency significantly by avoiding the need to remove locomotives from our block trains for servicing. The locomotives stay in the train consist for 10 days before being brought in for service. The introduction of two-man crewing and then driver-only operation have increased productivity and helped Queensland Railways to maintain competitiveness with road transport.

Rollingstock usage has increased substantially since the introduction of our computerised rollingstock information and control system. This has enabled us to retire many of our older wagons while still handling the large increases in tonnage.

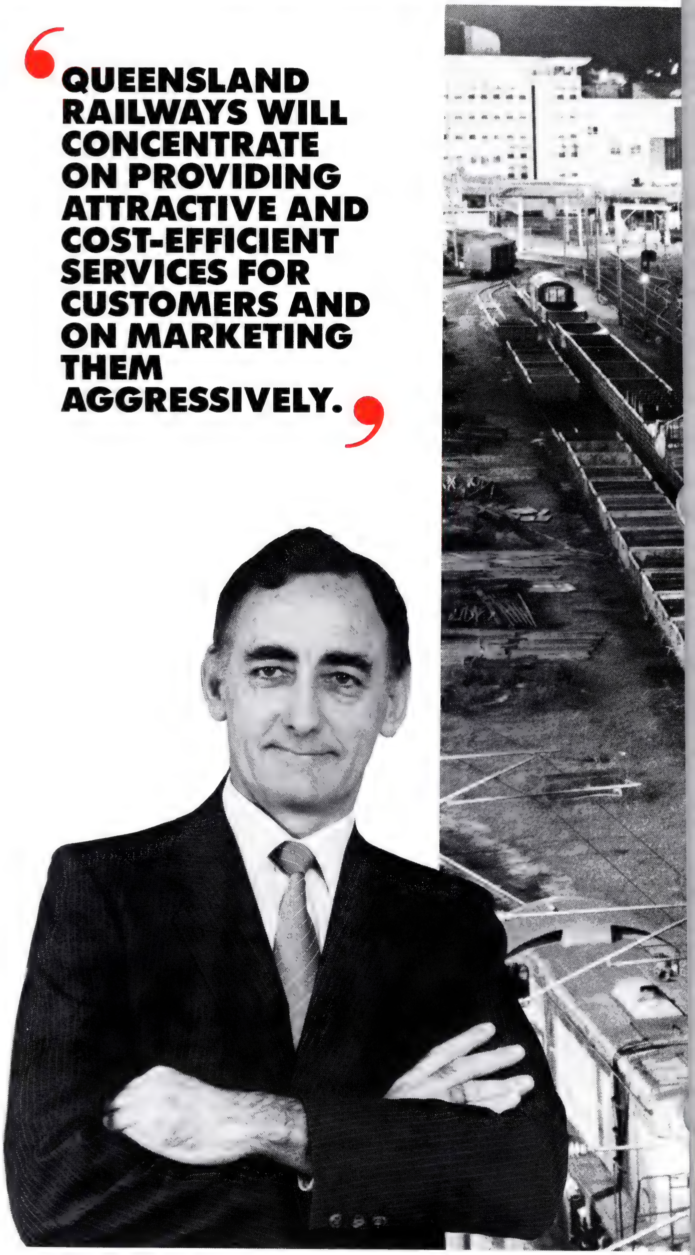
Greatly improved communications and CTC have played a big part in reducing train running times and improving usage of our rollingstock.

With the introduction of new technology and improved operating techniques, we have been able to retire many of our older wagons, particularly the high-maintenance wooden wagons. We also have a program of increasing wagon capacity; the 90-tonne wagon is our largest, although we now have a 100-tonne wagon on the drawingboard. Our wagon fleet is also being equipped with large-capacity automatic couplers, constant contact side bearers for high speed, and triple valves for improved braking response.

In the maintenance area, the big advances we have made in the past few years have been in the change to mechanised track maintenance. The rail reprofiling program has greatly increased rail and wheel life and also reduced track maintenance costs, as has the use of concrete and steel sleepers.

Major improvements have been made in the efficiency of our workshops through changes in work practices and the closing down of activities that could not compete with outside industry.

> **‘QUEENSLAND RAILWAYS WILL CONCENTRATE ON PROVIDING ATTRACTIVE AND COST-EFFICIENT SERVICES FOR CUSTOMERS AND ON MARKETING THEM AGGRESSIVELY.’**



Queensland Railways' acting Commissioner Robin Read.

QR's biggest freight train on the Brisbane-Rockhampton corridor makes its way through the Roma Street goods yards, Brisbane.

Over the past five years, there has been much emphasis on cost cutting and efficiency, and, even though our transport task has increased substantially in that time, staff numbers have been reduced by almost 20 per cent.

While there are still areas in Queensland Railways that will be made more efficient, cost cutting and staff reductions are becoming more difficult to achieve. Although over the next five years our cost-cutting measures will continue, the emphasis has shifted towards the income side of the ledger. Queensland Railways will concentrate on providing attractive and cost-efficient services for customers and marketing them aggressively.

Over the first five years of the 1990s, Queensland Railways will tackle a number of major issues.

☐ Our general freight infrastructure has emerged from a network created more than 100 years ago when roads and road transport barely existed. It needs restructuring, and we are developing an integrated road/rail network of freight distribution centres equipped with modern

‘THE NEXT FIVE YEARS WILL BE ONES OF EMPHASISING QUALITY SERVICES AND PROVIDING COMPETITION FOR ROAD TRANSPORT.’

freight handling equipment and served by express freight trains. Road transport will be used for collection and distribution, and this will enable the rail operations to concentrate on line haul and discontinue LCL traffic. We will provide our customers with an improved service, but not necessarily by rail.

☐ Our commercial activities are weak, and will be given a significant boost with a restructuring of the commercial branch, the appointment of product managers, and the establishment of a customer services section. We will integrate our management information systems, and our operating services will be driven by customer demand.

☐ Queensland Railways still has a traditional railway organisational structure; as a consequence, we are operations-and engineering-oriented. The thrust over the next five years, along with the bolstering of our commercial activities, will be to become more customer-or business-oriented. We must make our managers accountable for a bottom line; whether this will be achieved by remodelling the organisational structure on business lines or some alternative structure has still to be determined.

☐ Queensland Railways is still very much a government department and government policy is reflected in the rates we charge. All our community services obligations (CSOs), from providing suburban and long-distance passenger services at below cost, to maintaining little-used, uneconomic branch lines, and providing free transport for fodder, hay and cattle in times of drought are funded by cross-subsidisation from our profitable traffics.

This of course means we have to charge more for our profitable business than we need to in order to support our CSOs, thereby in many cases putting us at a competitive disadvantage to our competitors.

There are signs of a change in government policy on CSOs, and one of our thrusts in the next few years will be to obtain external government support for CSOs so that our commercial business is not burdened with having to support them, allowing us to compete more effectively with road transport for marginal business.

☐ Our interstate traffic on the Brisbane-Sydney corridor represents a very small percentage of our business and loses money for Queensland Railways. With improved services and some marketing, rail can win a much larger share of the market on this important corridor.

However, the 1930s agreement between New South Wales and Queensland discourages investment or the promotion of services by either party. In spite of this and the poor and frustrating service customers receive, tonnage on this corridor increased by 25 per cent last financial year.

It is important for the continuing viability of railways in Australia that key interstate rail corridors are not rendered impotent against road competition by historical and partisan constraints. A single organisation must operate these sectors to provide an effective transport service to our customers — a service not constrained by state boundaries. The road transport industry can provide this service to their customers; unless we can match it, we will continue to lose business to our competition. For this reason, Queensland Railways is fully supportive of the National Freight Initiative, with its aim to set up a single organisation to operate key interstate railway corridors.

These are some of the key issues Queensland Railways will face in the first half of the 1990s in order to become more competitive and increase our share of the transport market. We have been through a phase of massive investment in new special-purpose railways, new technology, cost cutting, efficiency drives, and staff reductions. The next five years will be ones of consolidation, with fewer cost-cutting initiatives and a significant change of emphasis to become more business-and customer-oriented, providing a quality service to the customer and aggressive competition for road transport.

Along Parallel Lines

By John Gunn

Melbourne University Press, 1989, $35.

RAIL AND POLITICS IN NSW

THE FULL STORY

In their 1989 report on the State Rail Authority of New South Wales, the system's American consultants, Booz-Allen Hamilton, drew attention to "excessive political involvement" as something that had led to many of that authority's evident problems.

John Gunn's book, a history of the development of railways in New South Wales, details much of that political involvement. It is a long but highly readable account of NSW railways since their inception: the pressures for construction; the difficulties that faced early engineers in overcoming both natural barriers and the preconceived notions of groups with particular interests; the constraints of tight budgets.

The author, who has also written a history of Qantas, quotes extensively from parliamentary papers, railway records, and the newspapers of the day. But while the work is a scholarly one, it will have a broad appeal. The author's narrative style and apt selection of illustrations mean that anyone with an interest in the growth of what became Australia's busiest railway system will enjoy the book.

Gunn takes the story of the people involved with rail development in New South Wales right up to the end of 1986. Dealing with recent events in a history is a daunting task for historians; Gunn has proved equal to it.

While the story of the New South Wales railways has been told partially in earlier works, On Parallel Lines must be regarded as the first full history and therefore worthy of a place on any bookshelf.

Ticket to Ride

By Anthony Dennis and Michael Raynor

Simon & Schuster, Australia, 1989, $24.95

AROUND AUSTRALIA IN 45 DAYS

RAIL EXPLORERS

Making journeys around Australia by rail, including trips on little-known outback rail services, seems to be coming into fashion among specialist writers.

Professor Colin Taylor of Queensland University published a thought-provoking book, 'Australia by Rail', (Bradt Publications) in 1988, and a reprint will appear shortly.

Similar in subject matter, Ticket to Ride is a well written and illustrated account of the month-and-a-half writer Anthony Dennis and photographer Michael Raynor spent travelling Australia on Australian trains ranging from the Dirranbandi Mail, the Gulflander and The Queenslander to the Tea and Sugar, the Indian-Pacific, and the iron ore trains of the Pilbara.

All in all, the intrepid travellers covered 20,000km.

The photographs in Ticket to Ride, and there are plenty of them, range from the very good to the outstanding. They tell a complete story of the epic journey, although there might be a few too many sunsets for most readers. Raynor has captured the typical train traveller in the outback of Australia very well indeed.

Anthony Dennis's style is readable, tempering fact with humorous anecdote. There is some lack of continuity — for example, leaping from the Pilbara to Kalgoorlie and from Alice Springs to Adelaide — but overall the word pictures show contemporary rail travel in Australia as it is, the good and not so good, the exciting and the mundane.

A word concerning format: the Times text is set to a very wide measure, causing some reading difficulty. Still, Ticket to Ride will give a lot of pleasure to travel enthusiasts wishing to roam around Australia without leaving their armchairs. It is good value at $24.95.

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REVIEWS

Railway Directory 1990
Edited by Chris Bushell

Reed Business Publishing,
1990, £36 ($72).

Two books take pride of place in the libraries of railway systems or suppliers to the railway industry. One is Jane's World Railways. The other is the more compact directory compiled by the publishers of the authoritative magazine Railway Gazette International, which for 1990 has been retitled simply Railway Directory – 1990.

The 1990 edition carries up-to-date information on mergers of manufacturers and railways, staff changes at senior levels, and even details of recent events in Eastern Europe and comprehensive statistics on the railway systems of countries behind the now crumbling Iron Curtain, information once regarded as secret.

The Australian section of the directory is comprehensive and detailed. Considering the recent changes, in personnel in particular, it is as up to date as any publication could be. If the data from other systems is as accurate as the Australian entry, the editor, Chris Bushell, and the publisher are to be complimented. Publishing an accurate international review of the world's railways is a herculean task.

The 1990 Railway Directory is an excellent reference guide that should be in the libraries of all railway systems and manufacturers, and represents excellent value at £36 ($92).

Modern Railway Track
By Coenraad Esveld

MRT Productions, 1989,
$140.

At the recent Heavy Haul Railways Conference in Brisbane, Dr Coenraad Esveld of Netherland Railways was both a session chairman and presented a paper on railway track geometry developments. He has been closely involved with new track maintenance techniques such as Strait, now being used by Australian National.

Modern Railway Track is the product of his 15 years of research and development in the field of permanent way, an effort aimed mainly at better cost control and quality.

Chapters deal with vehicle forces in curves and gradients, track loads, including vertical and lateral rail forces, and with longitudinal forces and their calculation and rail stresses.

Major sections are devoted to track inspections (for example, ultrasonics and track geometry recording).

Modern Railway Track, published in English, comes as a hardback of 460 pages with 450 illustrations, mainly in colour.

SKIDBUSTERS

Two Victorian Transit Patrol Officers have invented and patented a device that accurately analyses road surfaces and can provide vital information about accidents.

Senior Investigator Martin Taylor and Chief Inspector Fred Podhorodecki last year completed BA degrees in Police Studies, with majors in civil engineering and Police Administration, at Melbourne's Chisholm Institute of Technology, where they topped their year. For their joint thesis project, they invented the Podlor Mark II.

The Podlor is a small, robust piece of equipment that, when run over any surface, gives a graphic readout of what is called the surface friction co-efficient or the likelihood of skidding on that surface.

It could also be modified for similar use in studying rail accidents.

The Podlor simulates the condition and effect of a skidding car, truck, bike, tram, bus or train before a collision. It helps determine the vehicles' speeds and provides information about the drivers' behaviour.

Martin Taylor says they used the Podlor to analyse some fatal accidents in Melbourne last year and were able to get accurate results long before anyone else.

"The readout from the Podlor can also be used as a court exhibit, something never done before," he says.

Anyone can use the Podlor — all you have to do is pull it over the surface being tested.

"You take the readout to traffic engineers, and they'll know what speed is safe on the section of road," Martin Taylor says.

Fred Podhorodecki says it can be used to choose the right surface for roads, footpaths, pavements and even floors in public buildings.

"How many times do people slip and hurt themselves and then sue the owner of the building?

"We looked at a number of public liability precedents in our thesis, and the Podlor could be used to avoid those problems.

"It could be used to plan the best type of surface for a certain area or used to analyse the accident itself," he says.

Martin Taylor says there are two other surface testers on the market.

"One costs $12,000 and the other, a SCRIM truck, costs $600,000.

"Ours will cost about $2,000."

"The beauty of it is that it's so robust and so simple that any authority, corporation or police force could make it themselves under licence," says Fred Podhorodecki, who has now been seconded to V/Line.

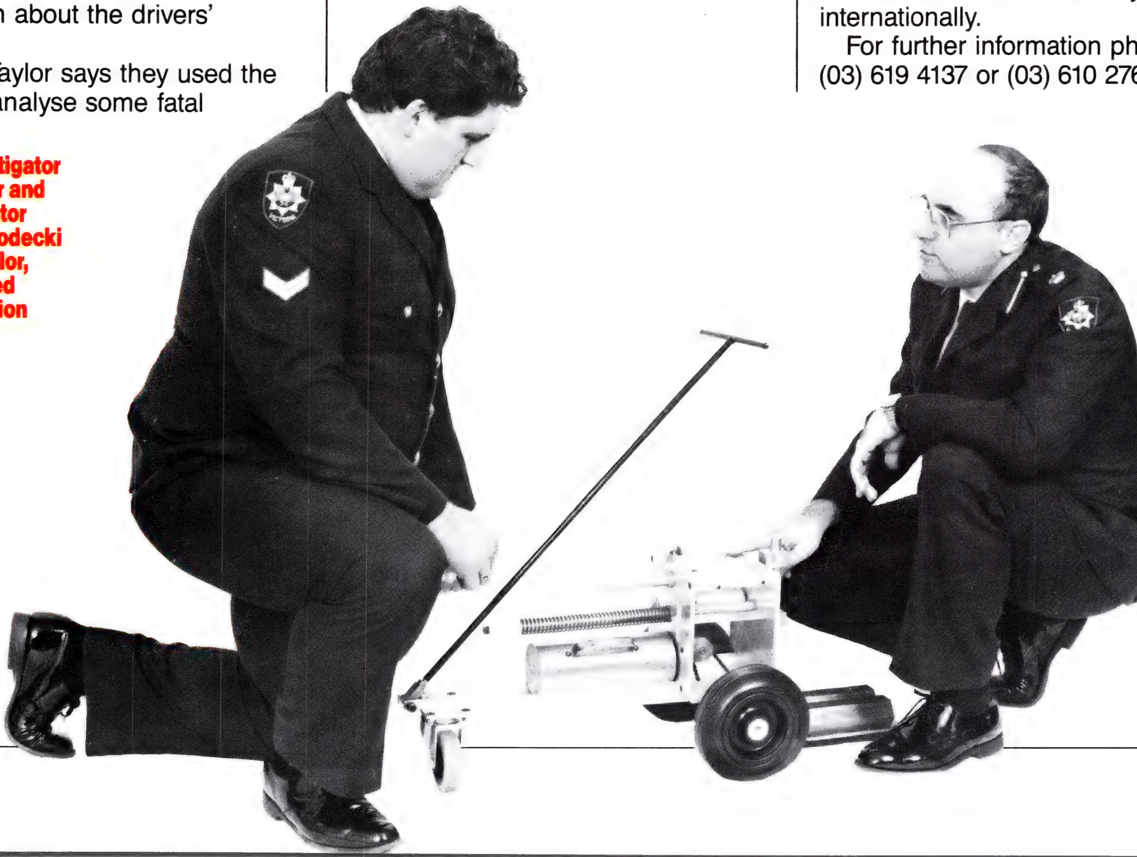
"Traffic engineers have an immediate use for it as well as loss assessors, city councils, commercial builders, and road corporations.

"For example, level crossings need a high surface friction level so cars won't skid in the wet or collide with boom gates or trains.

"What makes the Podlor so different is that it was designed to be used even in small areas with or without wet surfaces."

The inventors believe the Podlor will attract interest nationally and internationally.

For further information phone (03) 619 4137 or (03) 610 2768.



Senior Investigator Martin Taylor and Chief Inspector Fred Podhorodecki with the Podlor, their patented surface friction analyser.

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BR LOOKS TO THE SEEING-EYE COMPUTER

WINDOW SEAT

A computer with "eyes" may soon be controlling trains and traffic at railway level crossings in Britain if a new research project is a success.

British Rail's research company has asked the SD-Scicon company's advanced technology consultancy group to investigate the linking of a vision system to a transputer — a complete computer on a single microchip — that has been programmed to learn by example in a similar way to the human brain. Such neural networks, as they are known, are able to process large amounts of information in parallel rather than in sequence, as with a conventional computer.

An SD-Scicon spokesman said: "Neural networks are at their most powerful when applied to problems whose solution requires knowledge which is difficult to specify. Consequently, they are well-suited to pattern recognition and promise significant breakthroughs that have so far eluded conventional algorithmic approaches to vision processing."

Dr Alan Cribbens, head of safety systems at British Rail Research said: "While the high-level aim of the project is to produce a general-purpose vision system, attention will initially be focused on the application demonstrator. This will be capable of monitoring level crossings and deciding whether or not the roadway is clear before the barriers are lowered and rail traffic is allowed through.

"This application was chosen as it presents significant problems by way of camera motion, variable lighting and uncontrolled but permissable movement within the scene of interest." (LPS)

Westrail Commissioner Jim Gill with the system's new Plasser rail tamping, levelling and lining machine.

TAMPING GOES HIGH-TECH

Computers are not only helping to operate and run trains, they are also helping to improve the railway tracks. Westrail recently took delivery of its first computer-controlled rail tamping, levelling and lining machine.

The $670,000 track machine, built by Plasser Australia, features an automatic geometry guidance system (AGGS). This unit allows the machine to produce perfect track geometry.

It can be used in either automatic or engineer settings. In the first, it measures and records the existing track geometry, and then calculates the optimum geometry for that section of track.

The AGGS then controls the machine through the curve as it corrects the alignment, remembering that the rail length must always remain the same. The tamper also takes into account the fixed points on the track such as crossings and culverts.

In engineer, the track design requirements are fed into the computer and the machine produces that track.

"The real value of the AGGS is that it provides good, long-life geometry," says Don Pearce, Westrail's Chief Civil Engineer.

"Deficiencies in track geometry compound loadings and so increase the damage and wear. The savings this machine provides is another step in Westrail's drive for efficient operations."

Because of the storage requirements for measurement of data, the computer used is the IBM AT PC (or compatible) with a 40 meg hard disk and 80287 math co-processor.

The tamper can cover 5km in an eight-hour working day, or 80km/h while moving around the rail system.

MATHS SAVES FUEL

Co-operation in applied mathematics between a visiting Chinese scholar, Mr Cheng Jiaxin of the Anhui University, Hefei, and Dr Phil Howlett of the South Australian Institute of Technology has led to better understanding of fuel-efficient driving strategies for trains.

Dr Howlett and Mr Cheng worked on the problem of extending certain mathematical equations to a model being used by the Transport Control Group at the Institute of Technology. Their initial results were presented at the Conference of Australian Institutes of Transport Research (CAITR) at Flinders University in a paper entitled "Minimum cost strategies for the control of a train".

The Transport Control Group's ten years' work in this field developed Metromiser, a computerised train driver-advice system capable of fuel savings of more than 20 per cent. The group is now completing work on a related device for long haul trains. Associate Professor Ian Milroy, on behalf of the group, received a national award for innovative energy research in 1989 for this work.

Other academics in the Transport Control Group that developed Metromiser are Mr Basil Benjamin, Associate Professor Graham Mills and Dr Howlett. Two other group members, Mr Peter Pudney and Ms Sonya Perkins, work for Techsearch, the institute's marketing and consultancy organisation.

Dr Howlett said: "There are still several unsolved theoretical problems with optimal driving strategies, and it is now known that special equations can be used to provide more information. These equations determine what we have called 'critical velocities' and this should allow a more direct calculation of the optimal strategy.

"Essentially a train has to travel from one station to the next along a level track within a given time in such a way that the driving strategy minimises the total consumption of fuel. Ultimately, we hope that these results will assist the 'on board' calculation of fuel-efficient driving strategies."

Mr Cheng, who arrived in Adelaide in September 1989, and Dr Howlett are continuing their work and hope to complete it before Mr Cheng returns to China in September this year. They will soon submit further results to an academic journal.

Mr Cheng said: "We believe that our work can be further generalized and so we will continue with the development of some promising ideas."

The special equations used by the two mathematicians will be published in Dr Howlett's paper entitled "An optional strategy for the control of a train" to appear in 1990 in the Journal of the Australian Mathematical Society.

At the CAITR conference Peter Pudney presented a survey of the work being done by the Transport Control Group, and another group member, Sonya Perkins, tabled a paper entitled "Dynamic re-scheduling of trains".

For further information phone Dr Howlett on (08) 343 3195 or Susan Rintoul, SAIT Public Relations, on 236 2246.

HEATHROW EXPRESS SERVICE PLAN

London's Heathrow, the busiest international airport in the world, could be just 16 minutes' ride away from the centre of the city by 1994 under a £235m ($470m) plan for a new high-speed rail link.

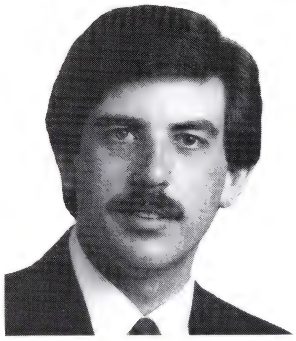
BAA, the British airports authority, and British Rail are seeking to build the link between the airport and Paddington railway terminal in central London. The idea is that new and quiet electric trains will run every quarter of an hour throughout the day, whisking some 16 million passengers a year to and from the giant four-terminal airport. If the project gets the go-ahead soon, construction work could start before the end of this year, with first trains running by early 1994.

The new Heathrow Express service, as it will be known, will use the existing main line out of Paddington for part of the journey. Then the trains will join a new branch line that will almost immediately descend into a tunnel to pass under open green-belt land, a motorway and two other roads. The up-line from Heathrow to Paddington will use a flyover.

The new line will be in a tunnel under the airport with two new stations serving all four terminals. Journey time from the three central airport terminals will be 16 minutes, while the outlying Terminal Four will be 20 minutes' ride from central London.

The first station will be deep below Heathrow's Central Terminal Area containing Terminals One, Two and Three. Two platforms and a central concourse containing ticketing, information and other services will be at the same level to allow easy movement. Each terminal will have a dedicated route from the station concourse, with a choice of either high-speed lifts, for people with baggage trolleys or in wheelchairs, or escalators.

Like the first station, Terminal Four will have two platforms and a central concourse, and direct access by lift and escalator to the centre of the terminal. New trains are being designed with spacious seating and generous baggage areas.



David Hamill is Minister for Transport in the new Queensland Labor Government. Mr Hamill also holds the portfolio of Minister Assisting the Premier on Economic and Trade Development.

Born in Ipswich, David Hamill attended the University of Queensland. In 1979, he became a Queensland Rhodes Scholar and holds an MA in Politics and Economics from Oxford University.

Mr Hamill is married with four children and lives in his Ipswich electorate, which he has represented since 1983.

N.R.
PALACE ON WHEELS

The PALACE on WHEELS

MICHAEL SCHRADER reports on a rail journey that recaptures the Raj.

ON THE FAR PLATFORM, ACROSS THE DOUBLE TRACKS OF THE MAIN LINE, SITS THE TRAIN THAT WILL BE HOME TO 84 PASSENGERS FOR SIX DAYS AND SEVEN NIGHTS. AT ITS HEAD STAND TWO GLEAMING BLACK YG-CLASS 2-8-2 STEAM LOCOMOTIVES, BRASS AND METALWORK SHINING, COVERED WITH ORNATE DECORATIONS.

PREVIOUS PAGES. Indian Railways YG-class 2-8-2 stands at the head of the Palace on Wheels on arrival at Jaisalmer, 1000km west of Delhi. Inset: The city of Jodhpur, crowned by the spectacular Mehrangarh Fort.

OPPOSITE PAGE. Top left: Crest of the Jaipur Saloon. Top right: YG 2-8-2 3415 carries the Desert Queen headboard at Delhi Cantonment Station. Centre: Passengers in the Bhavnagar Saloon with attendant. Bottom: Palace on Wheels passengers ride into the sunset at Jaisalmer.

What do you do with a fleet of luxury railway carriages that are no longer required by their original owners? Indian Railways, the world's second largest rail system under one management, came up with an answer. In co-operation with the tourism authorities of the Indian State of Rajasthan, they formed them into a special train and, each week during the cooler months, send them on a 2,400km journey westwards from Delhi into an area rich in history and rugged scenery.

The train, called the Palace on Wheels, made its first journey in 1981. Finding its departure point can be an adventure in itself. In the warm dusk of a Delhi evening, the taxi driver must make his way through the crowded city to a remote station on one of the lesser known routes leading out of the nation's capital.

Delhi Cantonment railway station sits on a metre-gauge line of the Northern Railway in the middle of a large military area on the city's edge. The word "cantonment" has strong imperial overtones (where else did the British refer to their military encampments this way?) and the name lingers on in many Indian cities.

Long lines of military buildings, barely visible in the gloom, pass by the taxi windows. Street lighting is sparse, and the taxi driver stops to reassure himself of his direction.

The railway station itself is a well-lit, clean oasis.

Assembly time is 7pm and the train staff are on hand to greet guests. Luggage is carted off by bearers, garlands of flowers, the first of many, are placed around necks. ("Well, I've been lei-ed already," said one female American traveller.)

On the far platform, across the double tracks of the main line, sits the train that will be home to its 84 passengers for seven nights and six days. At its head stand two gleaming black YG-class 2-8-2 steam locomotives, brass and metal work shining, covered with ornate decorations in the manner that *all* railways once welcomed VIPs. In the cabs th coloured lights produced by the humming turb generators glint, and steam oozes lazily into th night air. Departure time is 10.45pm.

The YG class 2-8-2s and their YP clas 4-6-2 cousins are the standard locomotives of post-World War Two India metre-gauge tracks. Some 1200 wer built, the first by Baldwin in the US, others in Japa and Europe, but most of them in India itself a Chittaranjan and Telco locomotive works. The Y closely resembles the broad-gauge WG 2-8-2 an is essentially a British design. The first example o the WG was exhibited at the 1951 Festival of Britain alongside V/Line's R class 704.

For this journey, YG 3438, called Desert Quee is the lead locomotive. The former owners of he carriages were princely rulers of various India states who, before the English withdrew from thei Indian empire, played an important part in th government of the country. After partition that rol altered significantly; certainly the princes' need fo private railway carriages lessened.

The oldest carriage, or saloon, was built in 188 for the Maharaja of Bikaner. The train has 14 sleeping coaches, a restaurant car and its annexe and a library and bar coach. Built in 1936 for the Maharaja of Jodhpur, the bar coach is the only air-conditioned vehicle on the train. For this reason, the train runs only in the cooler months; the deserts of Rajasthan are notoriously hot and unattractive to travellers during the Indian summer.

Each saloon is self-contained; there are no connecting vestibules through the train. In addition to sleeping compartments, each has one or two bathrooms. Coach attendants play a vital role in the trip's feeling of luxury. They wake the passengers in the morning, prepare breakfast in the small galley that forms part of each saloon, change the linen and make the beds, look after

See Page 58

JAIPUR SALOON

रानी रेगिस्तान
DESERT★QUEEN
3415
वाई जी

TO STAND AT THE VERY CORNER OF THE AMBER FORT ON THE EDGE OF THE CLIFF IS AN UNFORGETTABLE EXPERIENCE. THE SOUNDS OF A LARGE INDIAN CITY FLOAT UPWARDS IN THE STILL EVENING AIR – NOT JUST THE CAR HOOTERS AND THE MUSIC, BUT THE STEADY MURMUR OF THOUSANDS OF HUMAN VOICES.

passengers' laundry, and keep the saloon and all its facilities clean. In the evenings, they stand by to serve drinks from the bar. Service is never further away than the buzzer in each compartment and in the saloon at the end of each coach.

My coach was the smallest on the train. Known as the Bhavnagar saloon, it was built in 1935 for the Maharaja of Bhavnagar. The saloon had three coupes (two-berth compartments), and one shower/toilet/bathroom. My travelling companions were Americans, and we got along splendidly — something which is important in self-contained carriages. Special stops are made to allow passengers to walk from their saloon to the bar and restaurant cars for meals. The whole operation is smoothly stage-managed from start to finish. Passengers have only one objective — to see the sights of Rajasthan in comfort. And it all happens just that way.

After settling in at Delhi Cantonment, it is a good idea to take a close look at the two steam locomotives. Steam traction is used on only two sections of the journey. Until recently, the Indian Railways' broad and metre gauge systems had large numbers of steam locomotives in service, but the numbers are falling fast, particularly on the broad gauge. As the first dinner is served in the restaurant cars while waiting for departure, both steam and diesel-hauled passenger trains pass on the main-line.

Promptly at 10.45, the Palace on Wheels begins its journey. The high-pitched whistles of the YGs are used to good effect as the 20-vehicle train crosses over to the Down Main line and begins its westward journey.

The travel sensations are not unlike those on the old Broken Hill Expresses of the South Australian Railways before the construction of the standard gauge line between Peterborough and Cockburn in the 1960s. Wheels clank loudly on rail joints, the wooden bodies of the carriages creak, and, as the train nears its maximum permitted speed of 60km/h, a "springing" motion develops (in the Bhavnagar saloon, at any rate). Station stops produce the cacophony of sound that is part of Indian rail travel; a system carrying millions of people daily is never without passengers on its platforms.

On the first of the six nights of the journey most passengers find it difficult to sleep. The train's clientele is international, and many passengers have not used trains in their own countries, let alone in India. It is a new experience for a German group on an "incentive" tour, a party of Japanese, and groups of Americans, Britons, and three Australians. The train stops for only one of its seven nights to ensure that the passengers can see the best sights by day.

And so it is that on Thursday morning the Palace on Wheels reaches Jaipur, known as the Pink City because of the colour of the stones used to build many of the buildings. There is a ceremonial welcome, with more garlands, music and suitably decorated elephants. Coaches wait to take the tourists to the city's attractions, including the Jantar Mantar — the observatory of the heavens — built by an astronomer prince in the 18th century.

Lunch is taken at the Rambagh Palace Hotel, once the royal residence and one of several similar venues visited during the week. Afterwards we go to the Amber Fort, perched on a hill and reached by elephant. Large groups of monkeys scrabble over the fort's walls and stairways. Then it is off on a long winding drive by coach to Mahargarh Fort on a tall cliff overlooking Jaipur. We arrive too late to appreciate the magnificent view by daylight, but to stand at the very corner of the fort on the edge of the cliff is an unforgettable experience. The sounds of a large Indian city float upwards in the still evening air — not just the car hooters and the music, but the steady murmur of thousands of human voices.

Friday sees an early arrival at Chittaurgarh, reduced to ruins three times by invaders and rebuilt each time. The size of the fort — 700 acres in all — is impressive. Afterwards there is a taste of daylight travel during the four-hour journey to Udaipur, where we transfer to a boat to reach the Lake Palace Hotel for lunch. The hotel and the nearby City Palace have featured in James Bond films and the BBC's Jewel in the Crown.

Many consider this 16th century city to be the

Built in the 12th century, the huge sand castle of Jaisalmer rises out of the desert.

most romantic spot in India, set as it is inside a ring of hills.

Visits to the Palace Gardens precede a journey to a recently established folk museum displaying housing styles from all over western India. Passengers are treated to a display of tribal dancing, made the more authentic by the presence of many villagers from the development itself; the children are chastised for wanting to sit too close to the visitors.

Dinner that night is on board the train standing at Udaipur platform. We watch steam-hauled passenger trains departing in both directions.

Saturday morning allows more time for sightseeing in Udaipur. I choose to look at the railway activities. Thirty members of the local track gang in turbans and dhoties assemble at the eastern end of the yard for breakfast. They then begin work, re-sleepering and re-ballasting. A shawled woman with a pet monkey on a lead and a child walk past. At the other end of the yard, an underline culvert is being rebuilt. Teams of donkeys, each with two pannier, bags are loaded with ballast at one side of the railway. In a line, they are shepherded across the tracks to the centre of the yard, all of 300 metres, where the ballast is unloaded on to a heap. Bags empty, they trudge back to the loading point.

I talk to the young English-speaking supervisor, who is keen to practise his language skills. Then it is a three-wheeler auto rickshaw ride for the five kilometres to the locomotive depot. YGs and YPs are in various stages of repair and overhaul, and on the running roads labourers are coaling the locomotives in the traditional way — baskets on heads. They walk up wooden walkways to the top of the tender and tip the coal in over its side.

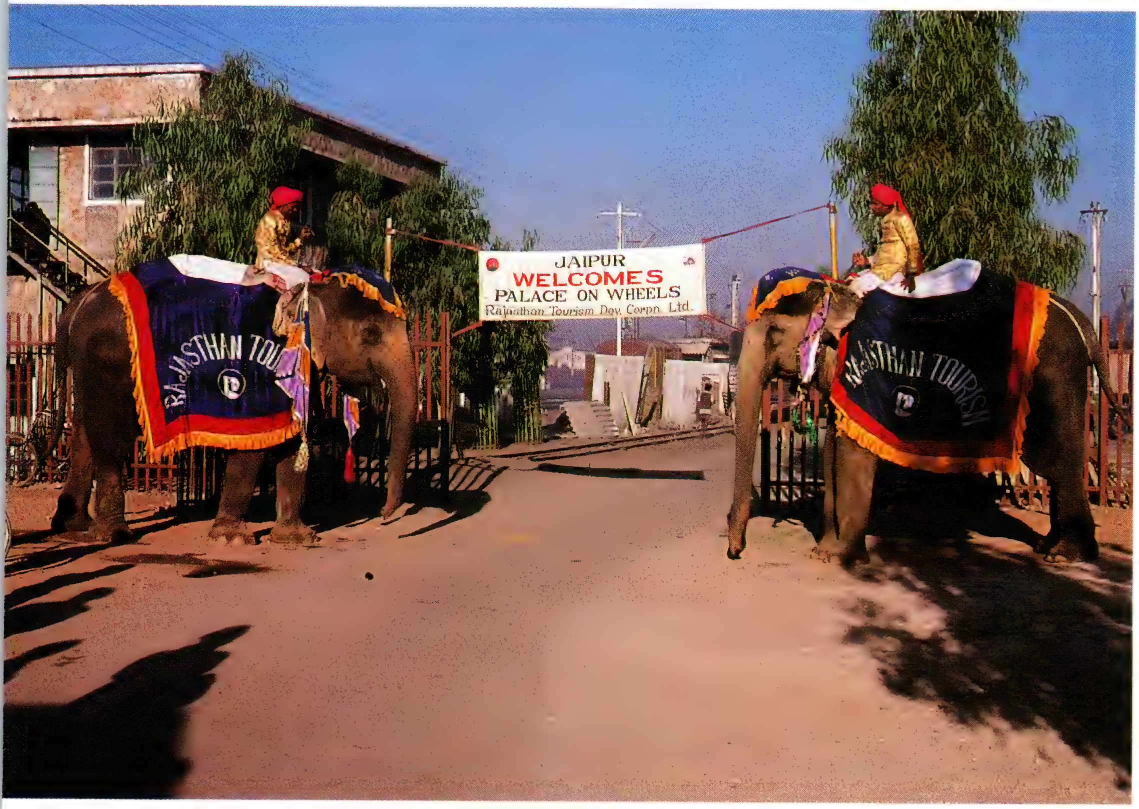
The first sitting for lunch begins as the Palace on Wheels leaves on the longest continuous section of its journey — through the afternoon, night and early morning to Jaisalmer. During the afternoon, the highest point on India's Western Railway is reached before the spectacular descent down the Khambli Ghat.

At strategic locations on the downhill journey, there are compulsory stops at signals to allow the resetting of a catch point. If the catch point is not reset, the train veers off the main line up a steeply graded (as much as 1-in-10) siding, much like the runaway ramps seen on Australian highways. I have never seen anything like this — and I am intrigued to note that the rails on the runaway ramps are shiny. (Ramps are a feature of US railroading.)

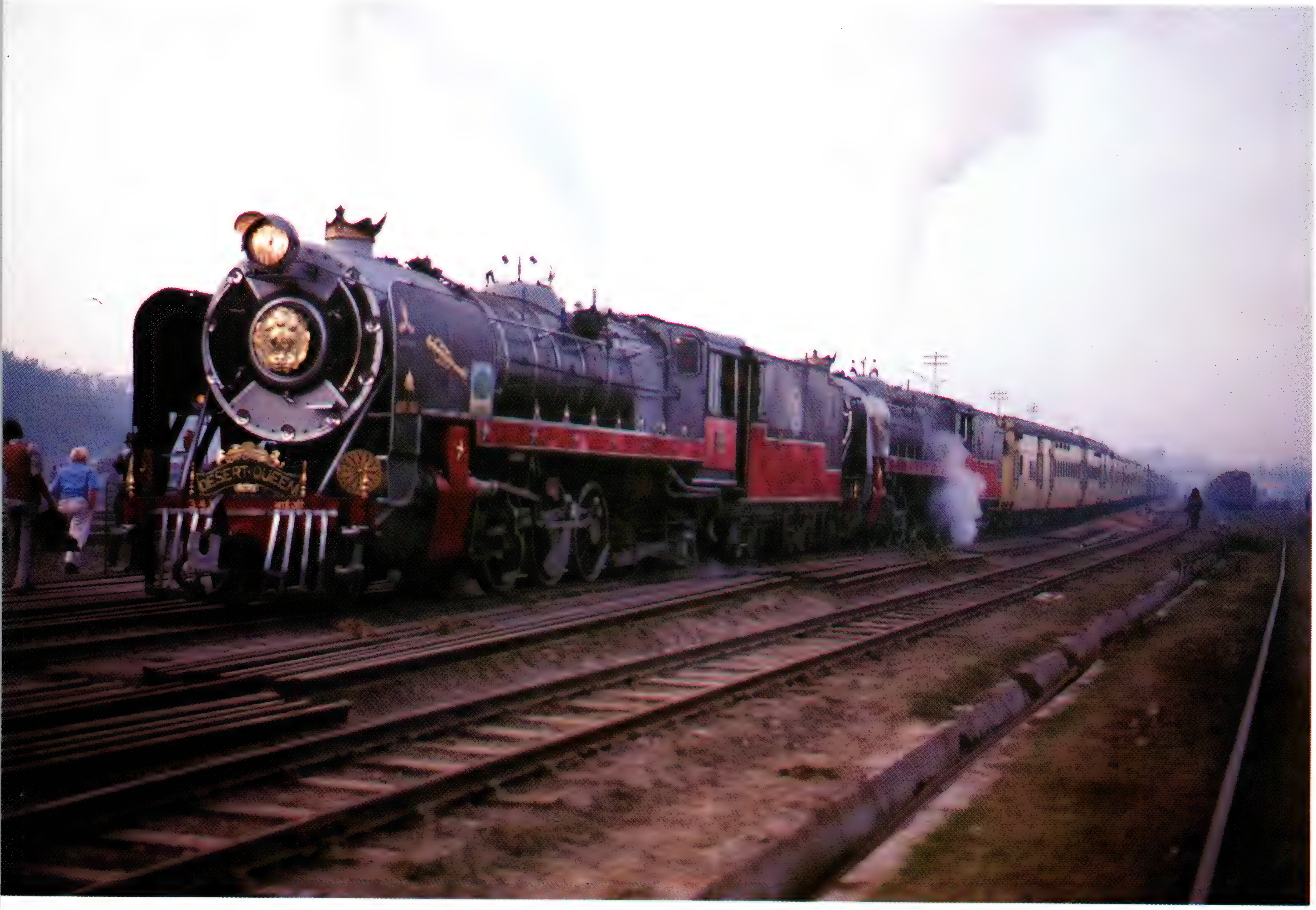
For the final run towards Jaisalmer on Sunday morning, steam comes back — a YG at the front and a YG assisting in the rear. I ride on the leading locomotive — there is no better way to appreciate *any* rail journey. The countryside is reminiscent of outback Queensland with its sparse vegetation and wide open spaces, but the architecture is unmistakably Indian.

Jaisalmer, the ancient citadel on the caravan route that linked India with Iran, Iraq and the Mediterranean, is dominated by its fort, still very much lived in. Below the fort, narrow lanes feature "Havellies" — houses and mansions with intricately carved facades. The carving is still practised, and we see buildings featuring it under construction.

The day ends with a camel ride towards the sunset and a view of the spectacular cenotaphs



Elephants in full regalia welcome the Palace on Wheels passengers to Jaipur. Below: At the end of a week-long journey, the Palace on Wheels stands at Delhi Cantonment station in the early morning mist.



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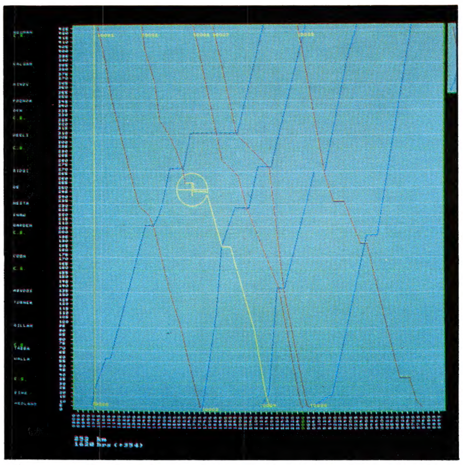
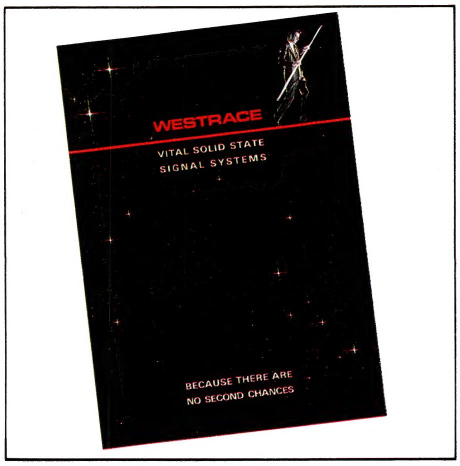
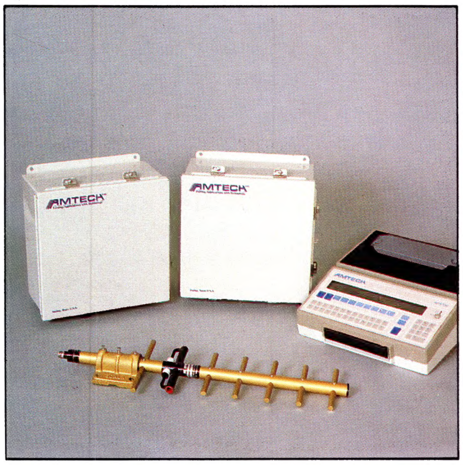
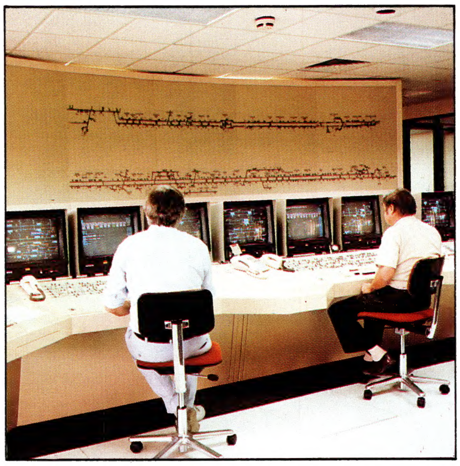



WESTRACE
VITAL SOLID STATE SIGNAL SYSTEMS
BECAUSE THERE ARE NO SECOND CHANCES





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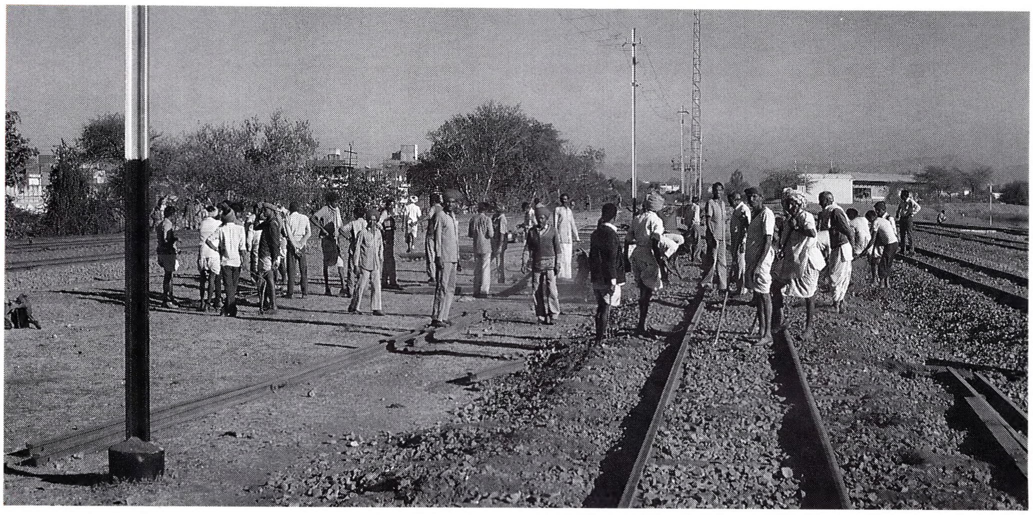


The beginning of another day on the Indian Railway: the track gang at Udaipur.

on the outskirts of Jaisalmer. That evening, dinner is served at a tourist bungalow run by the Rajasthan Tourism Development Corporation. Fires around the circle of guests fail to ward off the chill; it is intensely cold.

Back to the train and an overnight journey to Jodhpur, which gave its name to the riding breeches. The city was founded in the 15th century, and is surrounded by a wall 10km long. On the other side of the valley stands the modern Umaid Bhawan Palace, built by the Maharaja of Jodhpur during the depression years of the 1930s. The state had suffered a long drought and the Maharaja commissioned the palace to make work for his subjects, saving them from starvation.

Jodhpur Junction is a busy station. The Palace on Wheels is due to leave at 3.45, and while waiting I count the number of carriages in the passenger yard. I stop at 150 — about half the entire stock of V/Line's passenger fleet!

In the evening stops are made to allow visits to the lounge car before dinner. Then it is dinner and a return to our saloon for the second-last night on board.

On Tuesday morning, our arrival at Bharatupur is timed for 7am, with breakfast much later after seeing the Bharatupur bird sanctuary. Ever-obliging our saloon attendant prepares a light breakfast for us before we leave the train for the coaches.

In the wetlands here, migratory birds pause on their way from the arctic wastes to winter in warmer climates and on their way back. Other visitors are the only known surviving Siberian cranes — 17 in all. We glimpse a pair. Snake birds, water birds without natural oil on their feathers who must dry out in the sun after each immersion, are everywhere.

A buffet breakfast at the Saras Tourist Bungalow, also a Rajasthan project, is followed by a 45-minute drive to the ruins of Fatehpur Sikri. The former Mughal capital was abandoned, allegedly because of an acute water shortage, in the 16th century. It is a classic example of the Mughal architecture. Then on to lunch in Agra and, shortly afterwards, what must be the highlight of any visit to India, to the Taj Mahal.

It is my third visit and once again I am enthralled by the sheer beauty of the world's most famous monument. Even the vast crowds of tourists, most of them Indian, cannot detract from the experience.

Back to the train at Agra Fort station. Amidst the arrivals and departures at this important point, we eat our last dinner in the restaurant car before leaving for Delhi at 9pm.

For the last part of the journey, the two faithful YG class 2-8-2s resume their duties at the front, and we reached Delhi Cantonment right on time at 7.45 am. It is time for farewells to fellow travellers and to the train staff, especially the saloon attendant. Ours — "just call me PS" — had served us faithfully and cheerfully for seven nights and six days with the kind of personal attention most people never experience.

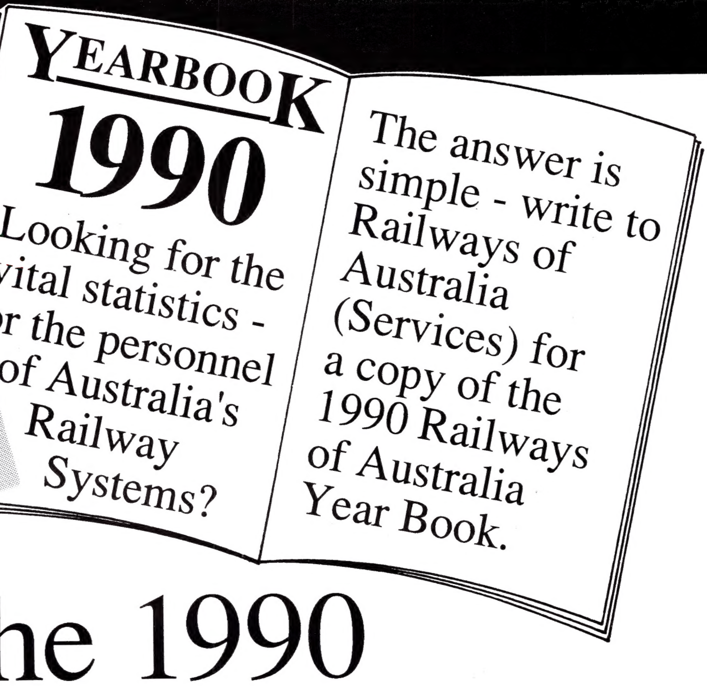
The future of the train is uncertain. The present coaches are nearing the end of their useful lives and must be replaced. Rajasthan Tourism Authority are determined to preserve a travel experience known throughout the world — and justifiably so. Although some tourists bemoan the lack of air-conditioning — this would enable the train to operate for longer periods during the year — I hope that the advantages of non-air-conditioned travel will not be lost. Being unable to readily open windows or doors would detract greatly from a rail journey that brings the visitor into close contact with all that railways mean in India.

At the very least, any new train should include at least one open-window observation car where the sights, sounds, and smells of an Indian rail journey can be experienced.

Restored luxury trains are now a feature of rail travel in many parts of the world, Palace on Wheels must be unique: there is no other journey in the world (apart from the Trans Siberian Express, which is a "transport" train) where a traveller spends seven nights and six days in the one railway carriage on a continuous tour.

Long may the Palace on Wheels, in whatever form, continue.

The facts about Australia's Railways revealed...



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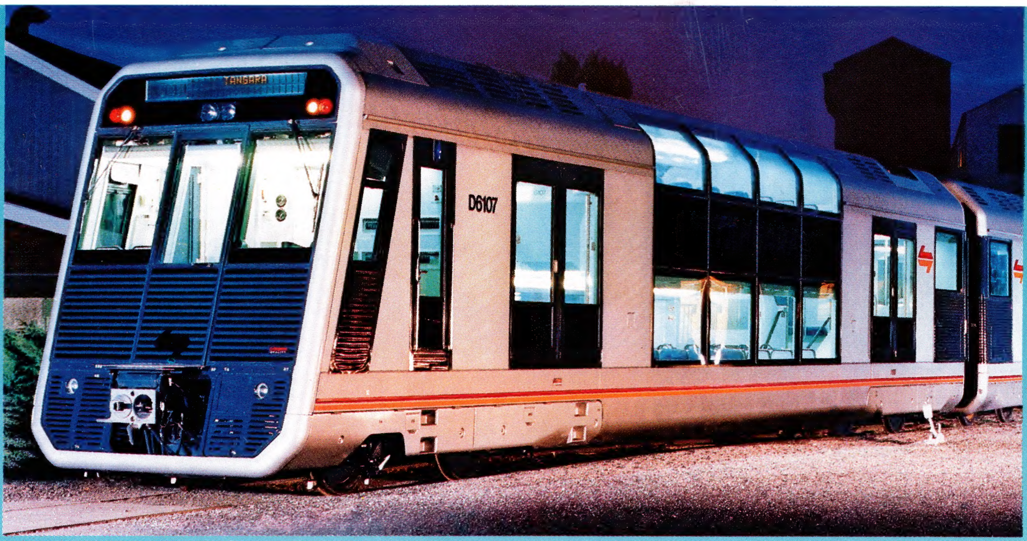

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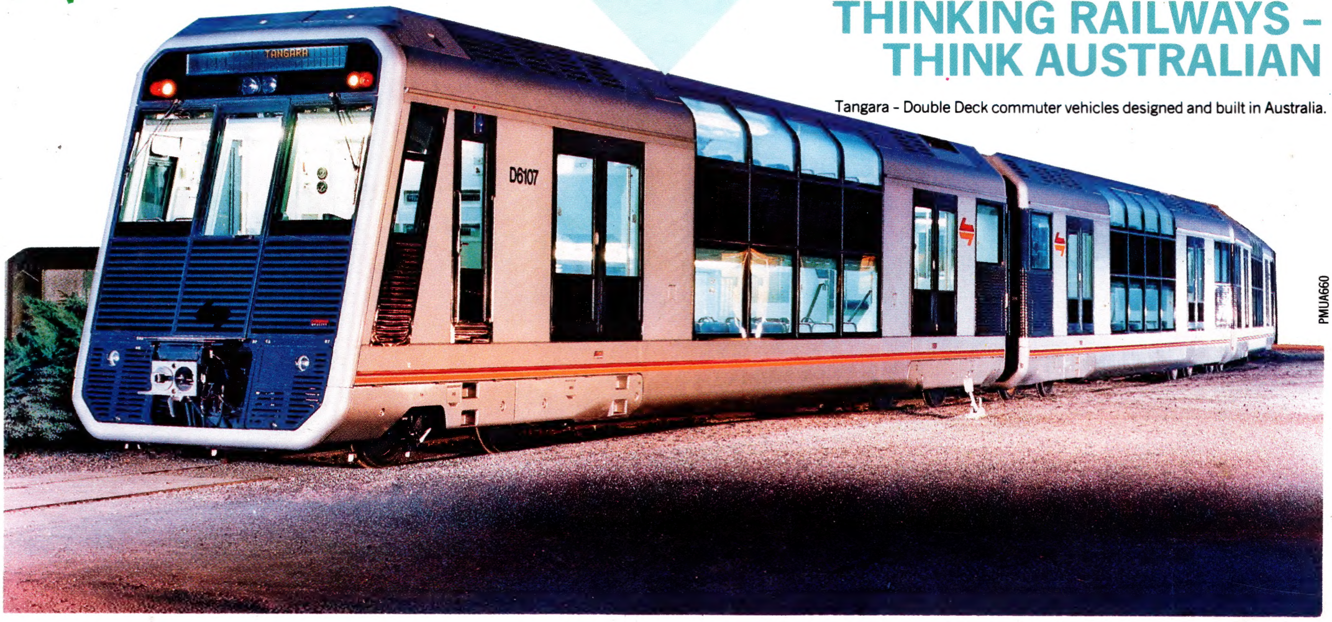

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